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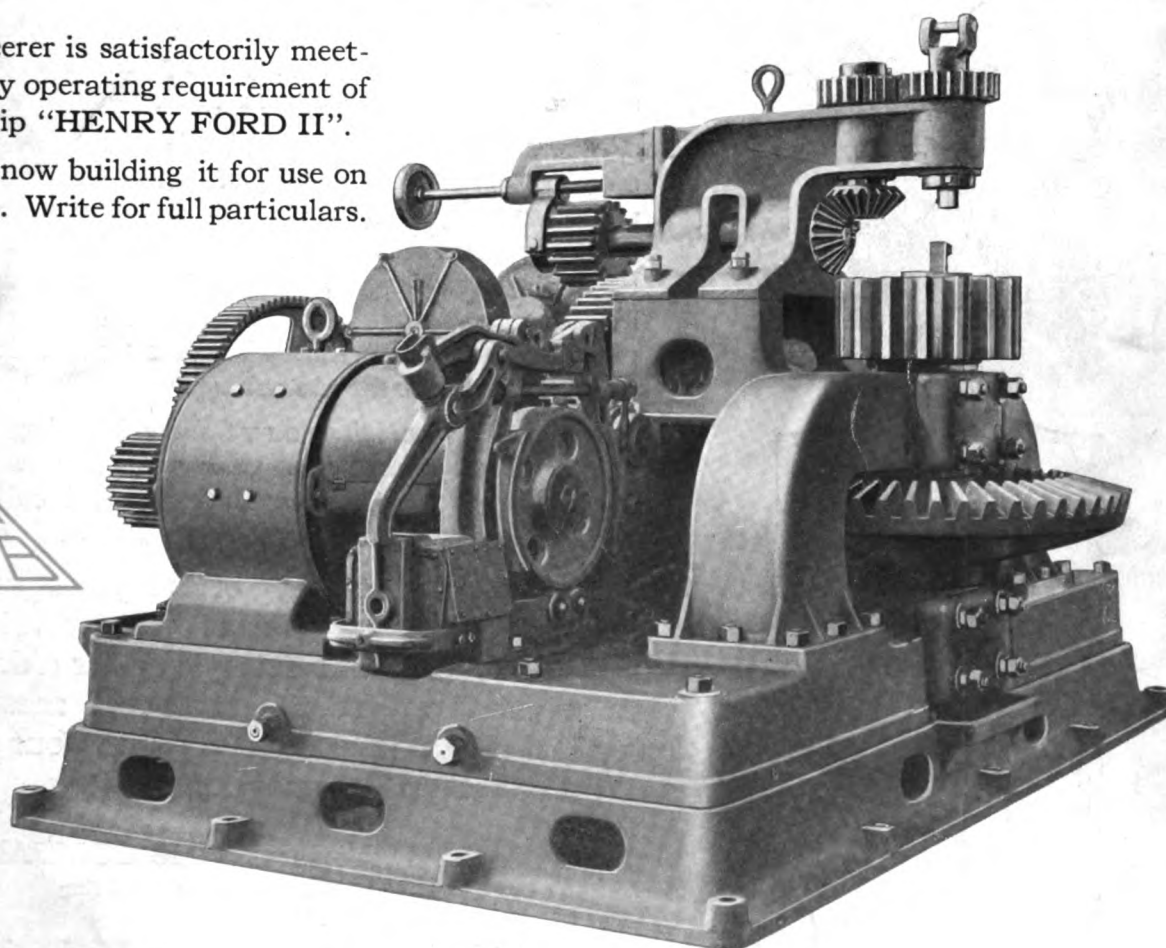
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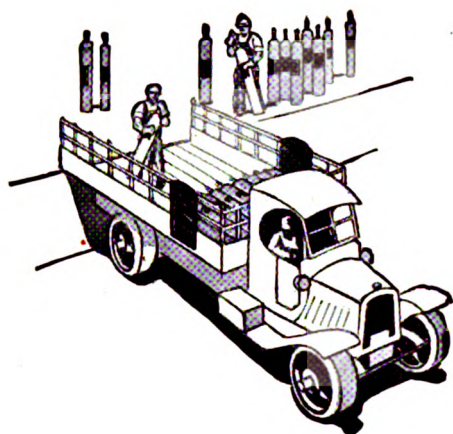
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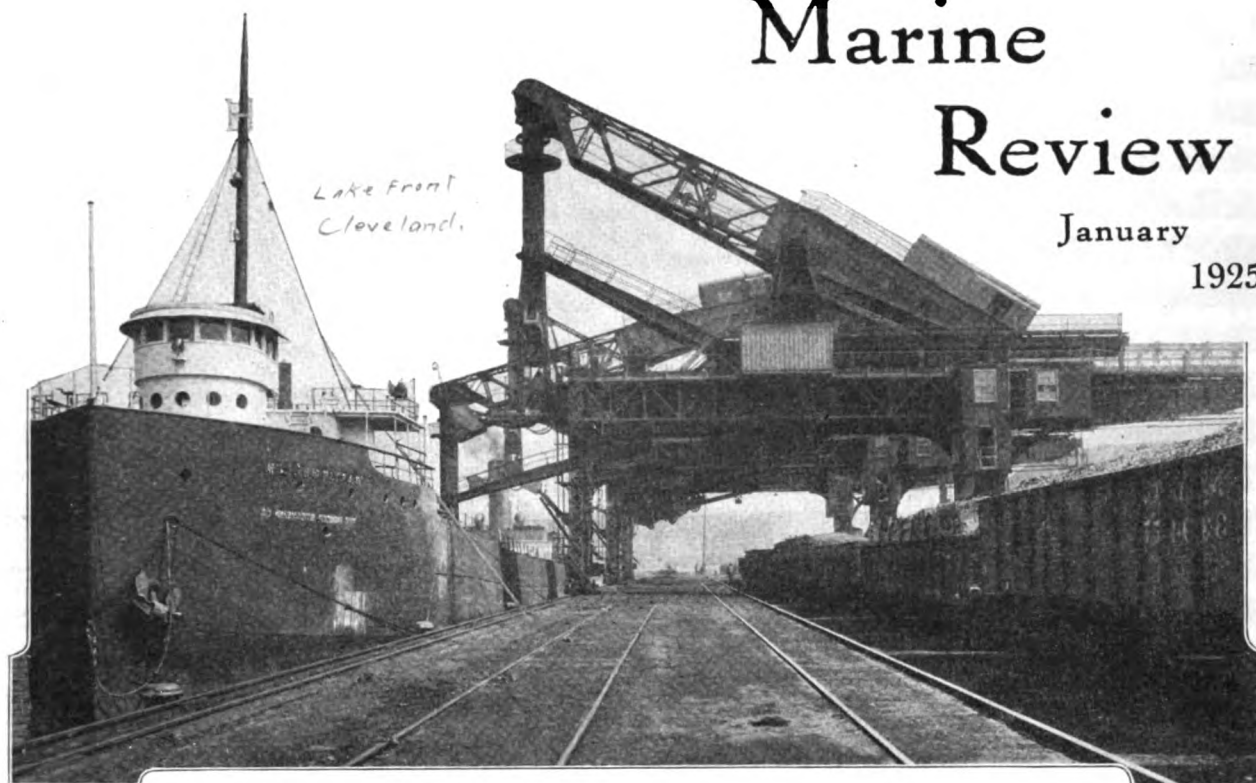


Fig. 1—Big grab buckets which take from 10 to 15 tons of iron ore from the hold of a lake freighter each time their maws close

Lakes Pay U. S. Large Dividends

BY L. C. SABIN

BECAUSE of its international importance and the publicity it received during construction, the Panama canal is one of the best known and most talked of waterways built by the United States.

When this canal was projected, a traffic of ten million tons was expected to develop in five years. Ten years after its opening, the actual amount of freight passing through in 1923 was 28,000,000 tons, carried in 5000 ships and paying \$23,000,000 in tolls. Its tonnage already exceeds that of the Suez canal, which in 1923 handled 25,000,000 tons in 4600 ships paying tolls of \$35,000,000.

The management of the transcontinental railroads may be of the opinion that the Panama canal is not a good investment for the United States because their traffic is being reduced temporarily by the use of the canal, but few would now agree with them. Even from a selfish point of view, these railroads may later reap the benefit of the greater trade and development brought about by the canal.

How is it with other waterway investments made by the United States? Are they paying a return in lower carrying charges or in the development of the country?

Another American waterway, perhaps

not so well known as the Panama but of greater commercial importance, is that of the Great Lakes, on which was transported in 1923 more than a hundred million tons of freight, carried in some twenty thousand ships, and paying no tolls.

Lake Trade Is Unique

The geographical position of the Great Lakes is peculiarly fortunate for the development of a large traffic by water. Their greatest extent is nearly in a line between the world's largest developed iron mines of Minnesota and upper Michigan and the vast coal beds of the Pittsburgh district; between the grain fields of the productive Northwest and the large consuming centers of the East. The physical conditions likewise are particularly favorable to the operation of large carriers, since the deep and broad expanses of the lakes above the Niagara river are joined by comparatively short rivers or straits, and in these connecting channels only certain reaches require improvement. Thus in sailing from Duluth to Buffalo only about 50 miles of restricted improved channels have to be traversed, and from Chicago to Buffalo about half as much.

This situation has built up an inland

traffic unique in its extent and in the low cost of transportation. As the greater part of the traffic is carried in bulk, the ships are so built as to facilitate loading and unloading. The size of the ships may be indicated by the fact that the average cargo eastbound is nearly 7000 tons, while the maximum cargo exceeds 15,000 tons. The average cargo on the Panama canal is about 5600 tons. The freight ton mileage on the Great Lakes in 1923 was about one-sixth of that of all the railroads in the United States. In a navigation season of about eight months, some of the larger vessels on the lakes carry from 400,000 to 490,000 tons of freight a distance of 800 to 900 miles, thus showing a record of some four hundred million ton-miles. Such an accomplishment is possible only through the greatest perfection in terminal facilities.

Coal is loaded by hoisting an entire car and dumping the contents into the hold of the ship. By this method from 1000 to 3000 tons per hour may be loaded.

An ore loading dock consists of a series of high bins, filled by cars running on tracks overhead. With the vessel alongside the wharf, these bins are discharged into the hull through chutes, this method being similar to that commonly used

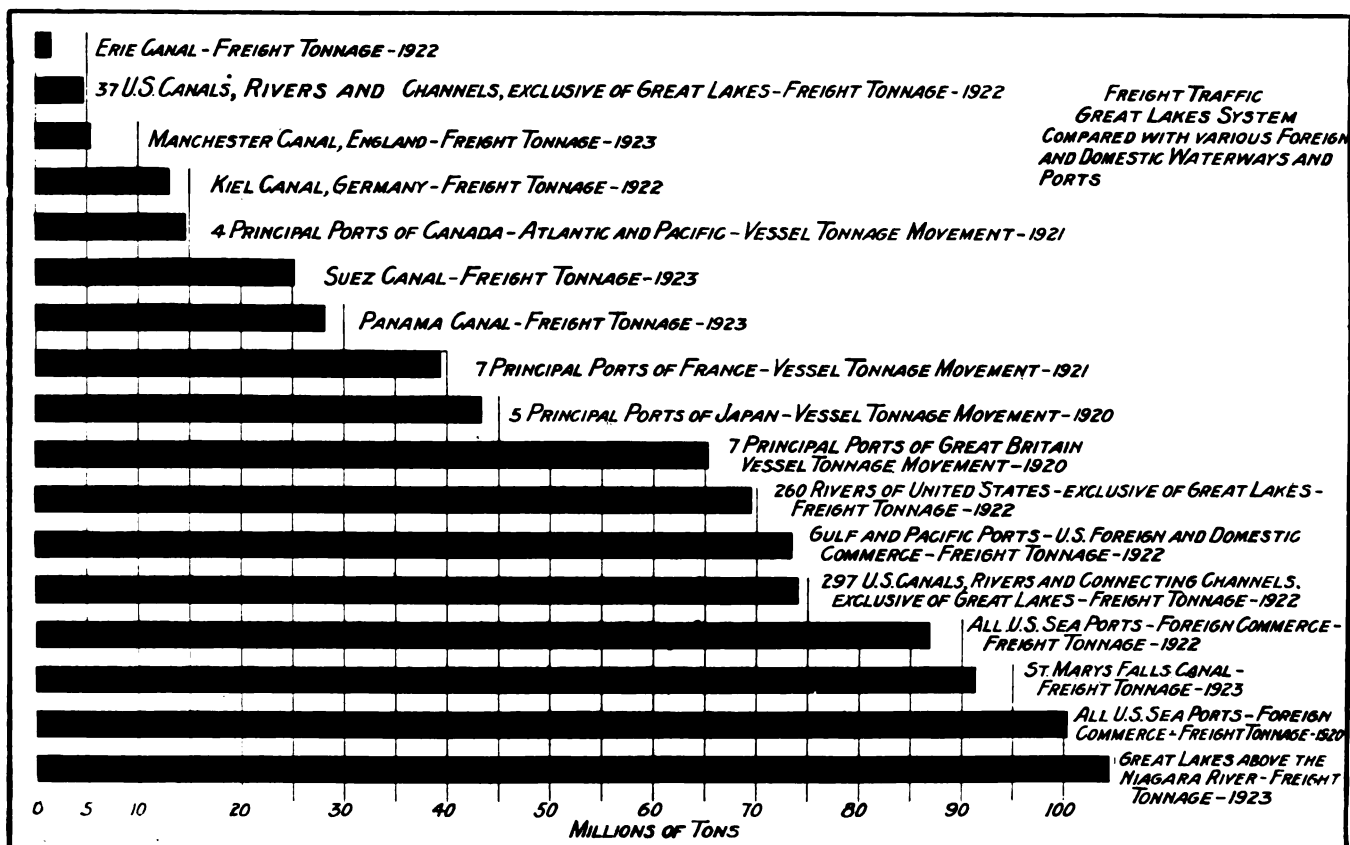


FIG. 2—HOW FREIGHT TRAFFIC ON THE GREAT LAKES COMPARES WITH IMPORTANT WATERWAYS, GROUPS OF PORTS, LEADING CANALS AND WITH THE ENTIRE FOREIGN COMMERCE OF THE UNITED STATES

in loading grain from an elevator. For unloading, huge buckets pick up ten tons at a bite, and deposit the material in cars on the dock. After the vessel is moored at the wharf, it requires but an

hour or two under favorable conditions to load 14,000 tons of ore, and but four or five hours to unload the same cargo at the receiving port.

That portion of this traffic passing

from and to Lake Superior has increased nearly threefold in 20 years. The tonnage of iron ore has increased from twenty million to sixty million tons, coal from seven million to eighteen million,

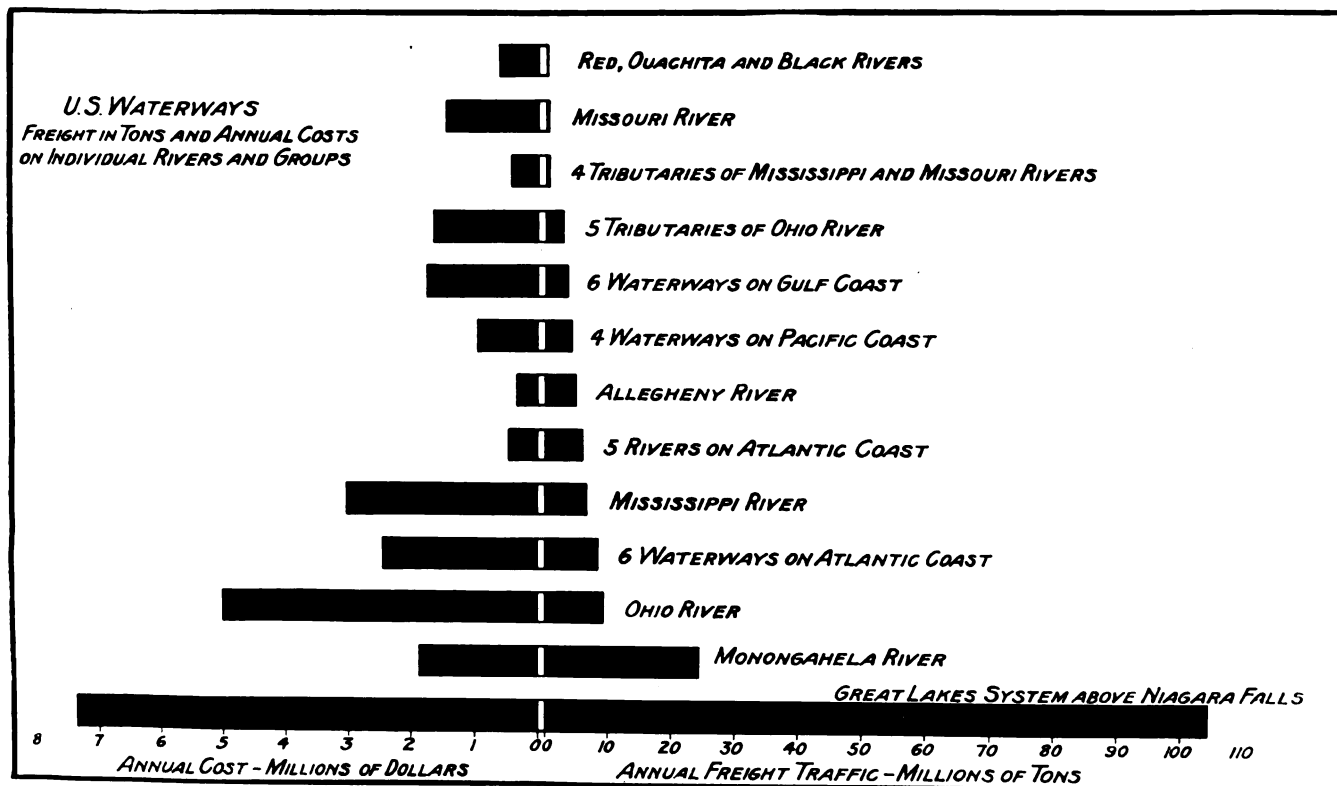


FIG. 3—HOW FREIGHT CARRIED COMPARES WITH COSTS ON LEADING WATERWAYS OF THIS COUNTRY

grain from a hundred million bushels to nearly four hundred million, while lumber has diminished from a billion feet to about two hundred million.

To compare the amount of freight traffic on the Great Lakes with that of various ports and waterways, Fig. 2 has been prepared. Wherever the data were available, the traffic is shown in net tons of cargo for the year 1923. In some cases an earlier year was taken and in others it was necessary to use the registered tonnage of the vessels concerned in connection with the record of arrivals and clearances.

It will be seen from the diagram that the Great Lakes traffic exceeds the foreign commerce of all the Atlantic, Gulf and Pacific coast harbors; it is 40 per cent greater than the commerce of

water courses for the use of navigation.

The creation of a new waterway or the improvement of an existing one may be justified by the character and volume of traffic, by the lower cost of transport, by the economic advantage resulting from the development of a locality not so easily reached and served by other means of transportation; or perchance justification may be found in the control of rates to be charged by other carriers. In evaluating each of these benefits, however, the capital charges and expense of maintenance of the waterway must be included in the cost of transportation.

Preparatory to the adoption of a project for the improvement of a river or harbor by the federal government, the

tent that the river and harbor act became popularly known as a "log rolling" proposition, or a "pork barrel" bill.

At certain times, efforts to have improved streams given more ample depth and width, and to extend the work to include other streams not yet improved, are particularly active, and, because of the recent overtaxing of the railroad system, we are now in one of those periods. At such a time the optimistic prophecies of benefits which are put forth by the ardent advocates of almost indiscriminate waterway improvements may be as unworthy of acceptance as the opinion of those who cry "pork barrel" whenever a law for the improvement of rivers and harbors is under consideration.

It is unquestionable that expenditures are sometimes made on projects where

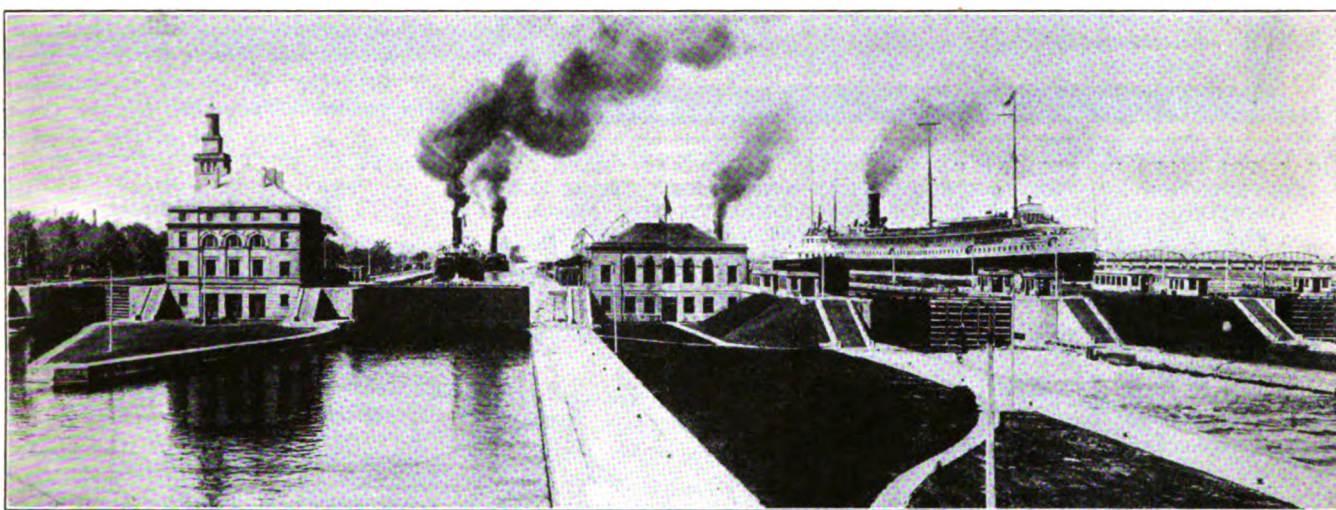


FIG. 4—TWO LARGE AND TWO SMALL LOCKS AT THE SOO HANDLE MUCH OF THE TRAFFIC ON THE GREAT LAKES, A TRADE WHICH IS ANNUALLY TWICE AS LARGE AS THE COMBINED MOVEMENT THROUGH THE PANAMA AND SUEZ CANALS

297 rivers and canals of the United States, three and a half times the Panama, and more than four times the Suez canal traffic.

The control of navigable waters in the United States is vested in the federal government, and the administration of laws concerning them rests specifically in the war department. Of the twenty-six thousand miles of navigable streams within our territorial limits, a length of some six thousand miles has a navigable depth of six feet or more. The remainder is available only for very light draft, or for floating logs.

The main flow of traffic in the United States is evidently east and west, and our larger railroad systems have been built to accommodate this traffic. Our largest river arteries flow generally north and south, and this has militated against their greatest usefulness. Recently the proportion of north and south traffic has been increasing, and if this tendency continues it will serve to enhance the availability of our natural

congress is supposed first to order an "examination and survey," to be made by the corps of engineers under the secretary of war. This results in a report by an officer or board of officers, or both, giving an opinion as to the extent of improvement, if any, that is considered worthy of undertaking and an approximate estimate of the cost. Thus in theory, the project is supposed to be passed upon by engineer officers expert in waterway development by reason of their training and experience. Unfortunately congress, before making an appropriation, does not always await this report, nor always follow the advice of the engineer department when received.

These appropriations are made by what is known as the river and harbor act, and it was formerly the practice to stipulate in detail the several projects and the amount appropriated for each. On account of the local interest of the congressmen, stimulated by some of their constituents, this resulted in the past in practices of vote trading to such an ex-

but little commerce is ever developed. This is illustrated by the case of the Ouachita and Black rivers, where a reach of 440 miles of channel is under improvement in Arkansas and Louisiana.

In 1900, a statistician employed by the Ouachita-Black River Improvement association predicted an annual saving of over three million dollars to result from improvement of the river. In 1902, congress adopted a project to provide 6½ foot depth, at an estimated cost of about two million dollars. At present, after a total expenditure of some six million dollars, about half the length of the river is available for through commerce at the depth proposed.

The present traffic is about 120,000 tons per year, 80 per cent of which is saw logs and timber products, carried only a short distance, with a freight rate reported to be 3 cents per ton-mile. Clearly if the annual saving of three million dollars anticipated by the optimistic statistician is realized, it must result from control of rates on a rail

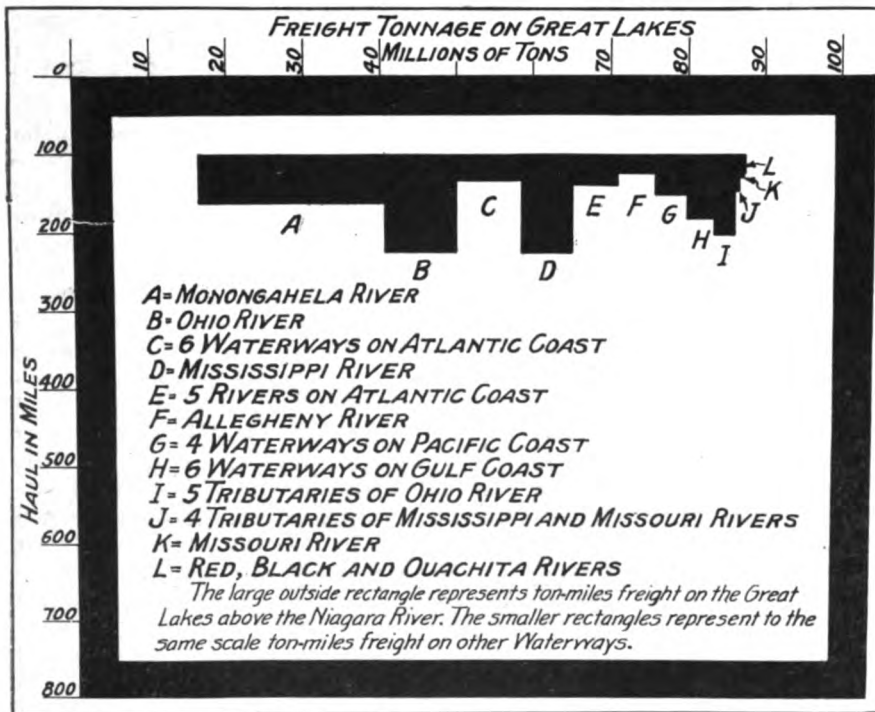


FIG. 5—TON-MILES OF FREIGHT ON THE GREAT LAKES ARE GRAPHICALLY REPRESENTED BY THE LARGE OUTSIDE RECTANGLE. FROM THE IDENTIFICATION LIST, PICK OUT AND COMPLETE THE SMALL RECTANGLE IN WHICH YOU ARE INTERESTED AND YOU HAVE A COMPARISON TO SCALE OF ITS RELATIVE IMPORTANCE TO GREAT LAKES FREIGHT TONNAGE

tonnage immensely greater than the traffic by the waterway.

In the past 20 years, the freight traffic of the Ouachita river has totaled less than three million tons, and the expenditures in the same period were \$5,591,115, or more than \$1.86 for every ton of freight carried.

On the St. Marys river a portion of the Great Lakes system, the expenditures, including improvement, operation and maintenance, in the same period have totaled about eighteen million dollars, and the freight traffic one billion three hundred million tons, a total investment of one and four tenths cents (\$0.014) per ton of freight.

A comparison of the Great Lakes commerce with that of the most important individual rivers and groups of inland waterways is shown in the accompanying table. The total expenditure on each river or group as given in the first column of figures is that expended for new work, and does not include the cost of maintenance, which in some extreme cases is almost as great. Five per cent of this total expenditure, for interest and depreciation, added to the cost of operation and maintenance for the fiscal year 1922 is considered to be the annual cost to the United States of maintaining and operating the waterway. The freight traffic for the Great Lakes is that for 1923, but the figures for that year not being available for the other waterways, the year 1920 is used, that year's traffic

being in general more favorable than 1921 or 1922.

It will be seen that the total freight traffic on the 37 waterways included in the table is but two-thirds that on the Great Lakes, while the annual cost is two and a half times as much, making

the average annual cost per ton of freight carried four times the corresponding cost for the Great Lakes system. The average cost per ton-mile for the 37 waterways is 40 times the similar figure relating to the Great Lakes commerce. The relation of annual cost to the volume of traffic for the several groups is shown in Fig. 3.

Not only is the amount of freight carried on the Great Lakes so much in excess of that on other inland waterways, but the average distance the freight is carried is much greater. The number of tons of freight multiplied by the number of miles carried gives the measure of the use of a waterway in ton-miles. The comparative results in this regard are shown graphically in Fig. 5, where the area of the large square enclosed in black represents the ton-mileage on the lakes, and the areas of the smaller black rectangles within represent the ton-mileage for the other waterways as indicated. The number of ton-miles for the Great Lakes is 16 times that of the 37 other waterways.

How Costs Compare

The economic importance of a waterway is measured by the volume of traffic and total cost of transportation per ton mile. The latter is made up of two parts; the charge for capital investment, maintenance and operation, and the cost of carriage, or the freight rate.

Comparative costs for the several waterways as to capital investment, maintenance and operation, exclusive of

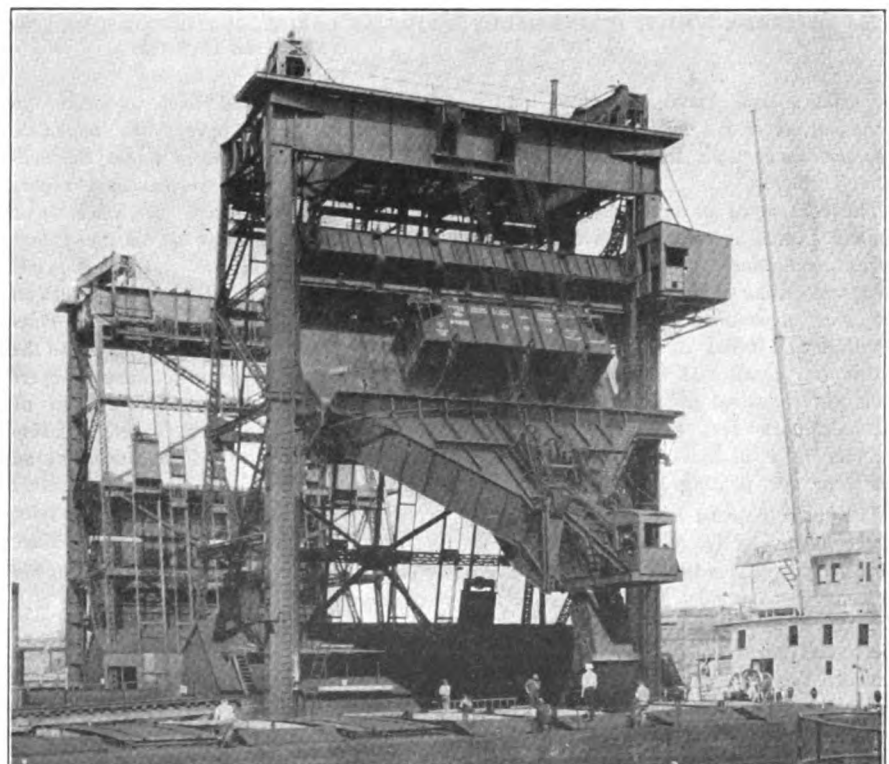


FIG. 6—LOADING COAL BY THE CARLOAD ON A GREAT LAKES FREIGHTER

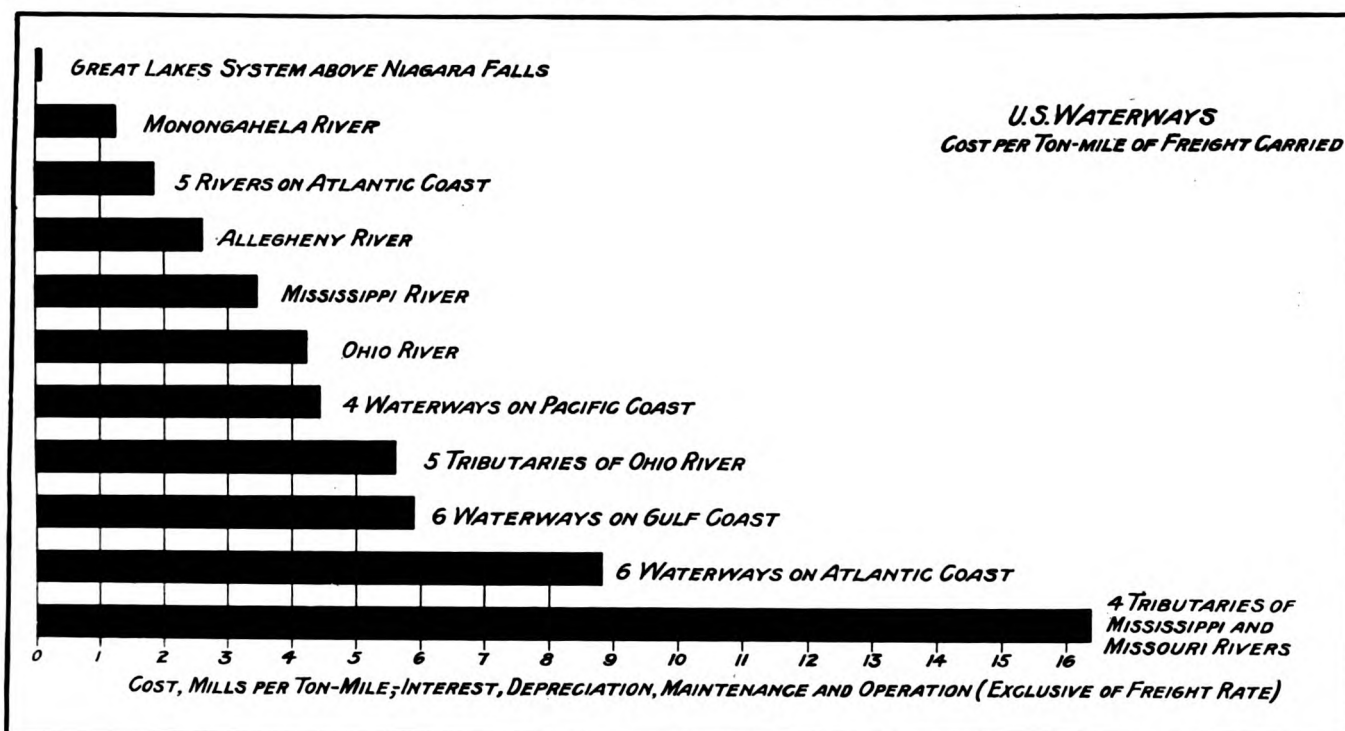


FIG. 7—COMPARATIVE COST PER TON MILE OF FREIGHT CARRIED ON THE PRINCIPAL WATERWAYS OF THIS COUNTRY

freight rates, are shown in Fig. 7. The lowest cost for a waterway, other than the Great Lakes, is indicated for the Delaware river from Philadelphia to Trenton, where for an average annual investment cost of \$63,000, freight to the extent of about two and a half million tons is carried 33 miles. This river is included in the five Atlantic coast rivers. On the Sacramento river, where over half the freight was sand

and water, the investment cost is about ten times that on the Great Lakes; this river is one of the group of four on the Pacific coast. On the Monongahela river, where coal is the principal commodity carried, the investment cost per ton-mile is 11 times that shown for the Great Lakes system.

For several of the interior waterways, on which millions of dollars have been expended, the cost to the United

States in interest and maintenance charges exceeds a dollar for every ton of freight carried one mile.

As to the carrying charges or freight rates, data are very incomplete, but it may be said that the freight rate on the internal waterways is seldom less than ten mills per ton-mile.

On the Great Lakes, from 1889 to 1903 the average freight charges per ton-mile fell from 1.5 mills to about 0.9

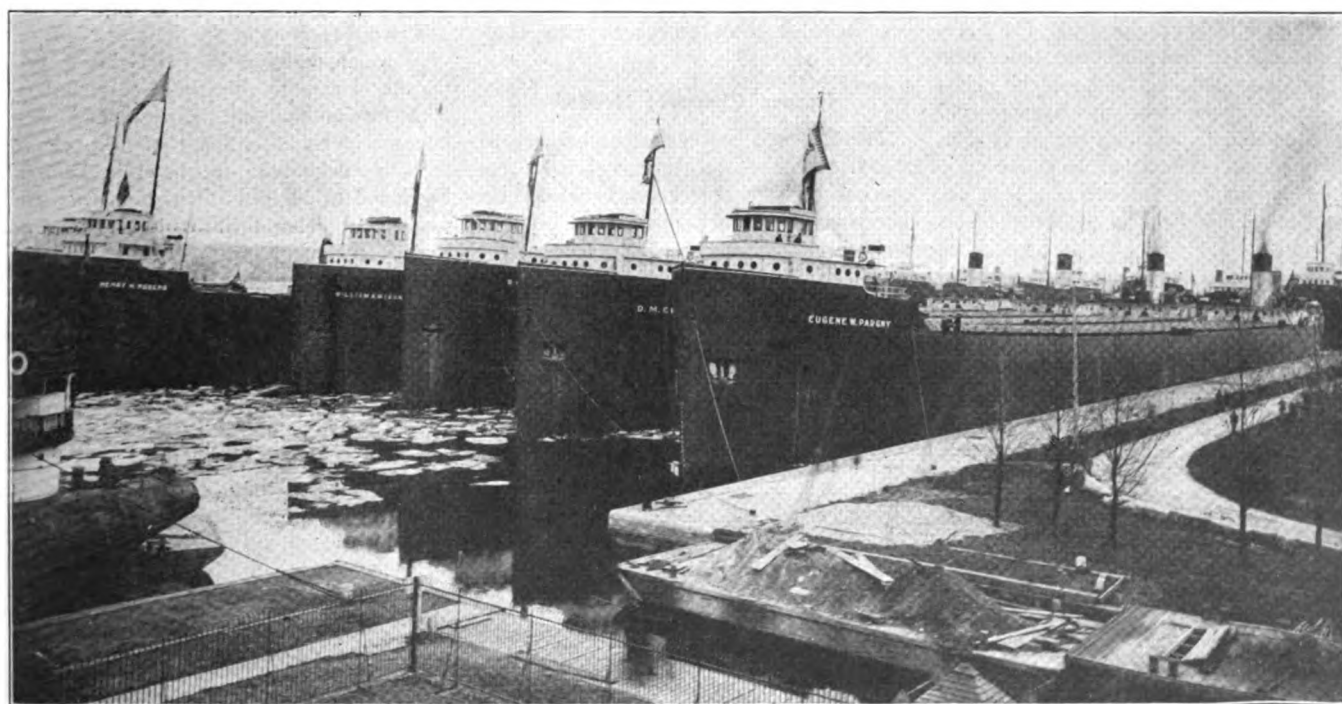


FIG. 8—LATE IN APRIL OR EARLY IN MAY EACH YEAR, THE BIG FREIGHTERS OF THE GREAT LAKES CLUSTER AT SAULT STE. MARIE AWAITING THE BREAKING UP OF THE ICE WHICH MEANS THAT NAVIGATION HAS OPENED FOR ANOTHER SEASON

How Freight Carrying Costs on Main Waterways Compare

Waterways	Expendi- ture on improve- ment up to June 30, 1922, exclusive of maintenance, \$	Annual cost: main- tenance plus 5% of costs \$	Annual freight traffic in thou- sand tons	Annual freight movement in thousand ton miles	Annual cost— Per ton of freight, Per ton- mile, Per ton- mile, \$ mills	
Black, Ouachita and Red Rivers	7,876,783	605,423	118	2,749	5.130	220.00
Missouri River	23,363,159	1,439,126	356	10,670	4.050	134.88
4 tributaries of Mississippi and Missouri Rivers	5,449,795	408,368	524	24,879	0.780	16.40
6 waterways, Atlantic	33,675,252	2,425,737	8,425	275,789	0.288	8.83
6 waterways, Gulf	21,830,306	1,722,196	3,596	292,867	0.479	5.89
5 tributaries of Ohio River	21,236,983	1,640,064	2,857	291,655	0.574	5.62
4 waterways, Pacific Coast	13,880,246	936,260	4,147	211,945	0.226	4.43
Ohio River	72,433,668	4,987,000	9,382	1,182,190	0.532	4.22
Mississippi River above New Orleans	46,264,399a	3,020,253	6,669b	847,000	0.453b	3.46
Allegheny River	3,393,621	309,628	4,948	118,759	0.063	2.61
5 rivers, Atlantic Coast	4,137,603	433,947	5,946	234,576	0.073	1.85
Monongahela River	8,064,981	1,860,282	24,264	1,504,390	0.077	1.24
Sum, 37 waterways, exclusive of Great Lakes..	261,606,796	19,788,284	71,231	4,997,469	0.278	3.96
Great Lakes System	118,614,853	7,338,610	104,470	83,576,000	0.070	0.09

(a) Exclusive of expenditures for levees, etc., made under Mississippi River Commission.

(b) Since in the traffic reports the freight tonnage of the Mississippi River is given by sections, the total freight, obtained by adding the traffic of the several sections, is too large, as it includes some duplications, making "cost per ton of freight" too favorable.

mill, due to the improvement in channels and consequent economies in ship transportation. From 1904 to 1914, the rate dropped to 0.6 mill, partly due to further improvements but also to the 1914 depression. In the post-war inflation the ton-mile rate rose to a maximum of 1.33 mills in 1920 and declined to 1.10 mills in 1923, with a further drop in prospect for 1924.

The corresponding average charges per ton-mile on the railways were about 9 mills in 1890-1892, reducing to a minimum of 7.15 mills in 1917, and a post-war rate of 12.7 mills in 1921. The average rail rate is thus about ten times that on the Great Lakes. It should be pointed out, however, that the average rail rate is derived from all classes of freight, and for short as well as long hauls.

In 1923, the rate for carrying iron ore from the mines to lake shipping points on railway lines 60 to 120 miles in length was 77 cents per ton, or 7 to 13 mills per ton-mile. Likewise on the railroads carrying ore from lower lake ports to the furnaces from 60 to 400 miles, the rate varied from 5 to 15 mills per ton-mile. Thus for railways carrying almost exclusively freight similar to the bulk products on the Great Lakes, the ton-mile rate is, in some cases as low as five times the water rate.

It is important to note the saving in the cost of transportation by the Great Lakes over rail carriage. On that portion of the total lake traffic passing to and from Lake Superior through the canals at Sault Ste. Marie, Mich., in 1923, the lake transportation charges amounted to 81 million dollars. If we add to this the annual cost of mainten-

ance plus 5 per cent interest on the entire investment in Great Lakes channels and harbors, we have a total of 88 million dollars as the cost of transport of 91 million tons over 800 miles. Assuming the best rate by rail to be five times the net lake rate, gives a rail cost of 405 million dollars, showing a saving in one year of 324 million dollars, or nearly three times the entire expenditures ever made by the United States on the Great Lakes system.

What equal investment has the United States made or in what other enterprise can it enlist promising such rich commercial returns?

Deeper Channels Needed

The channels and principal harbors of the Great Lakes are improved to a theoretical depth of 21 feet, but because of the prevailing low water, due to lack of precipitation, and in some degree to the withdrawal of water by the Chicago drainage canal, the actual navigable depth at present is but 19 feet.

The modern lake freighter is designed for a draft of at least 23 feet, and thus the larger vessels are deprived of a carrying capacity corresponding to a diminished draft of 4 feet. Computation shows that an increase in available draft of only six inches in the 1923 traffic would have meant that the Great Lakes fleet could have carried about three and a third million tons more freight with only a slight additional cost for fuel and labor, resulting in a net saving of over two and a half million dollars.

Ninety-five per cent of the freight tonnage is carried by vessels capable of

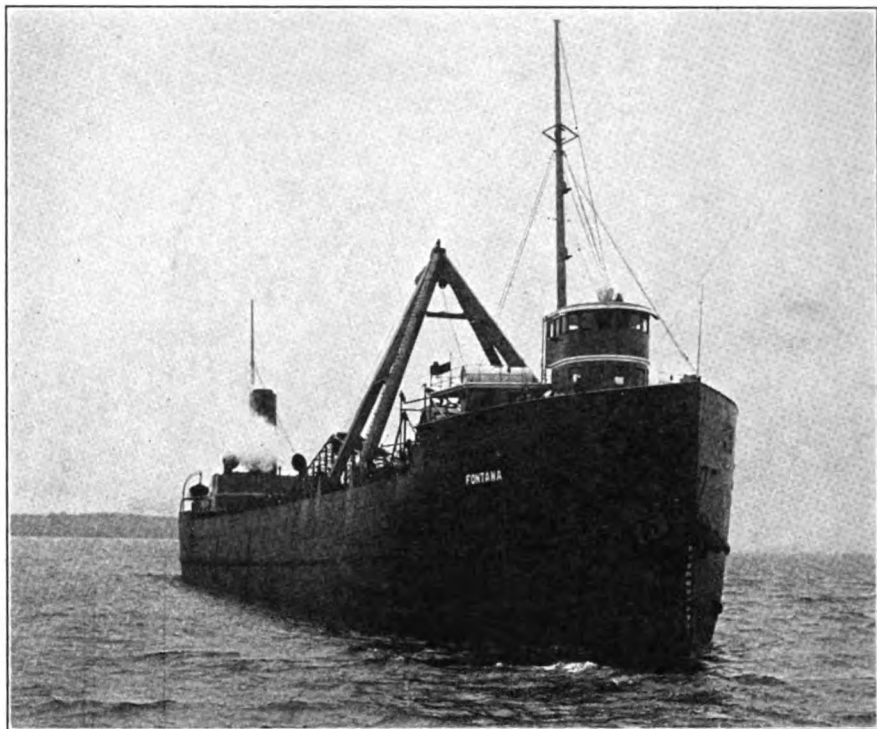
drawing 21 feet, so that an increase to this depth would result in a proportional saving, or about ten million dollars. A further increase to 23 feet draft, obtainable in a 25-foot channel, would not at once produce a proportionate gain, since this is beyond the practical draft of the smaller types of carriers, but it is estimated that with the present fleet a total gain of fifteen million dollars per year would result were a 25-foot channel made available. This saving would increase as the obsolescent smaller vessels are replaced by the modern type.

There has been much agitation for a deep water outlet from the Great Lakes to the ocean to facilitate our contact with foreign markets, which would dictate an increase in depth of lake channels to at least 25 feet, and in greater likelihood to 30 feet. Opposition to these plans may delay their fruition for several, if not many, years, but the analysis of the economy of lake transportation and of the further gains to be developed by greater drafts shows that the advisability of a 25-foot depth on the Great Lakes stands firmly on the foundation of interior commerce, quite independent of any possible future connection with the sea.

Two important units of the extensive shore repair plant to be erected by the Burrard Drydock Co., Ltd., as a necessary part of the equipment for the new 20,000-ton floating drydock at North Vancouver, B. C., are to be initiated at once. The construction will involve an expenditure of approximately \$100,000. The units comprise a large machine shop and blacksmith shop.

Finds New Use for Old Ships

By R. V. SAWHILL

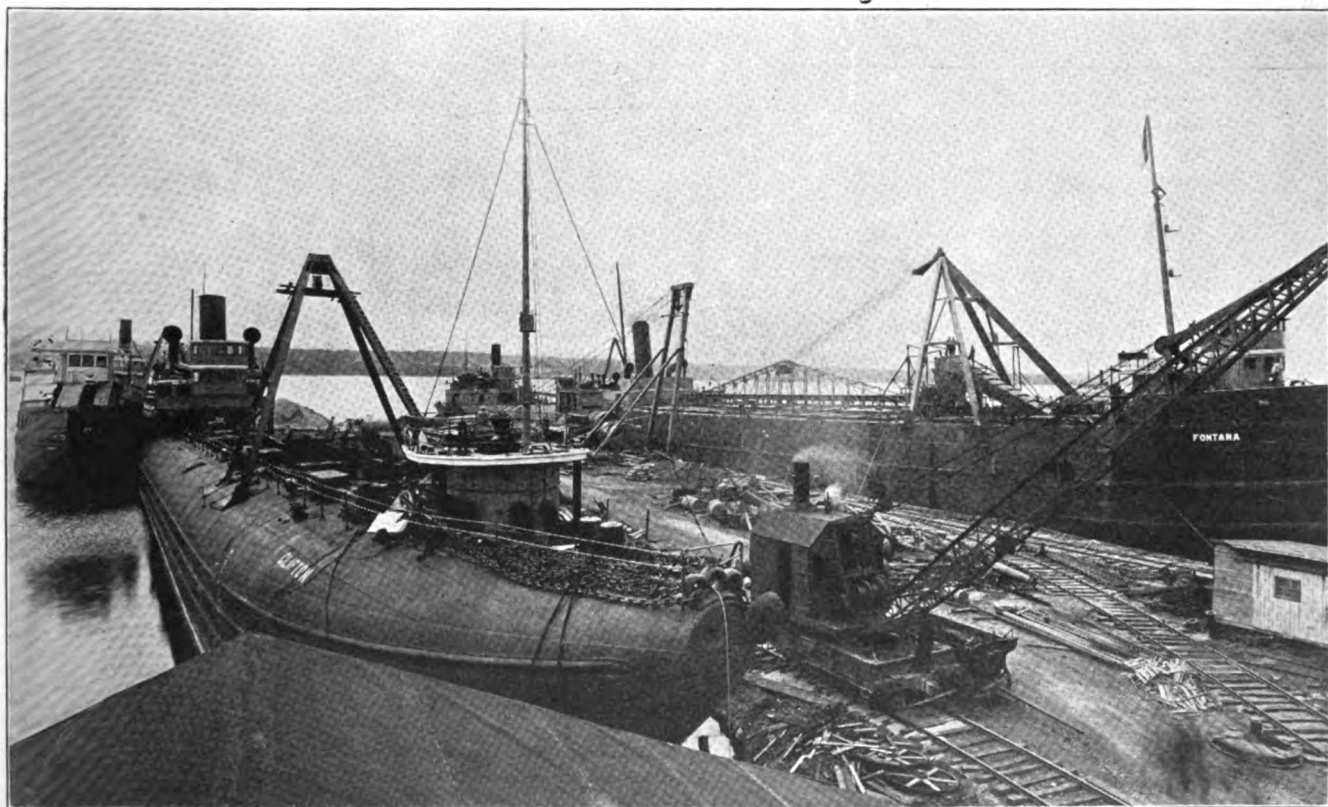


SELF-UNLOADER STEAMER FONTANA, FORMERLY STANDARD TYPE GREAT LAKES BULK FREIGHTER

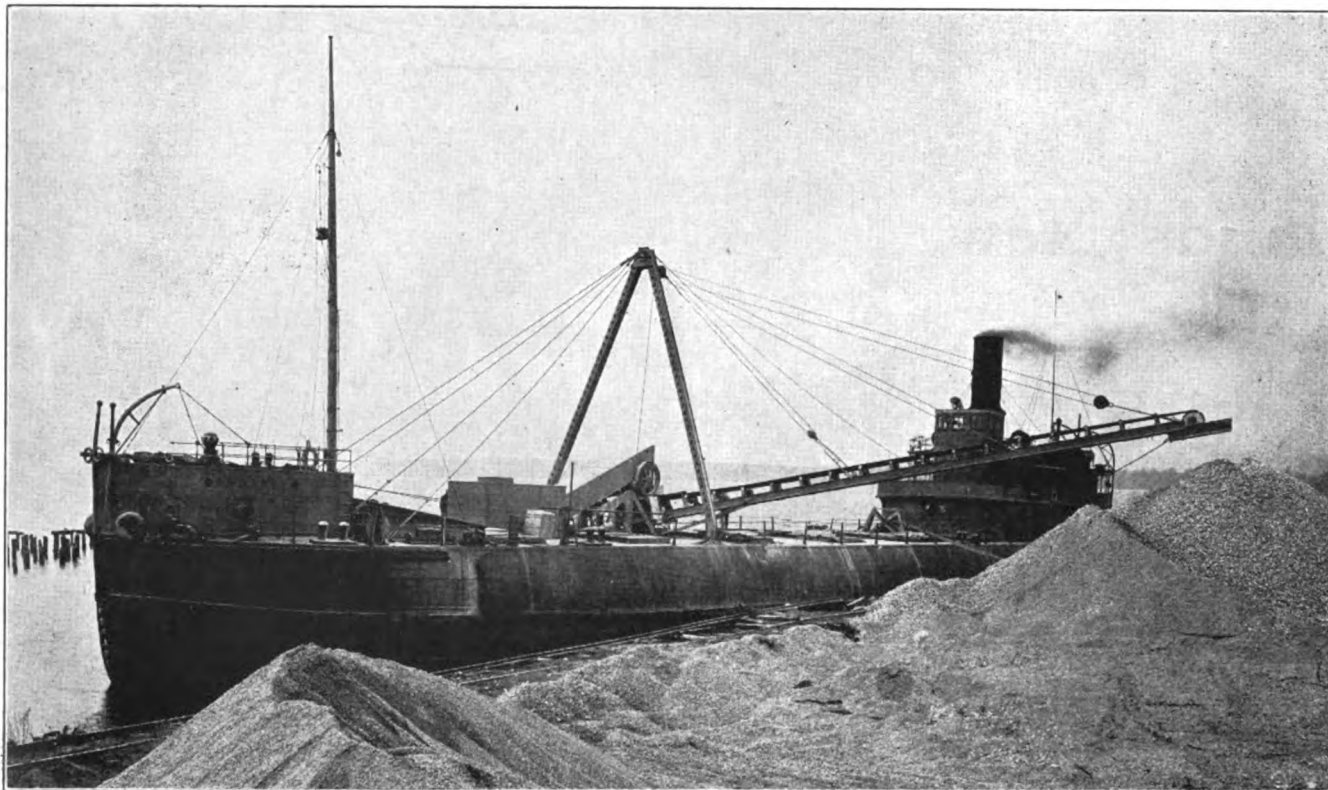
ON THE Great Lakes and inland waterways, bulk freight makes up the greater part of the commodities transported by vessel. This freight includes stone, iron ore, grain, sand, gravel, hard and soft coal, salt, sulphur, etc. On the oceans, a smaller

but growing portion of the trade is represented by this class of freight. The result of this condition on the Great Lakes has been the development of special designs of ships which, unlike ocean freighters, carry no means for unloading the freight they transport. The

sources of supply and delivery are constant so that shore plants can be built for loading the bulk material at one end of the route and for unloading it at the other end. This fact explains first the lake bulk freighter with its engine room aft and its long cargo hold reached by



FOUR LAKE STEAMERS FITTED WITH NEW SELF-UNLOADING INSTALLATION ARE SHOWN. PARTLY HIDDEN BEHIND THE OLD CAR FERRY IS THE BAY STATE, IN THE FOREGROUND IS THE CLIFTON, CENTER BACKGROUND IS THE ANDASTE AND AT RIGHT IS THE FONTANA



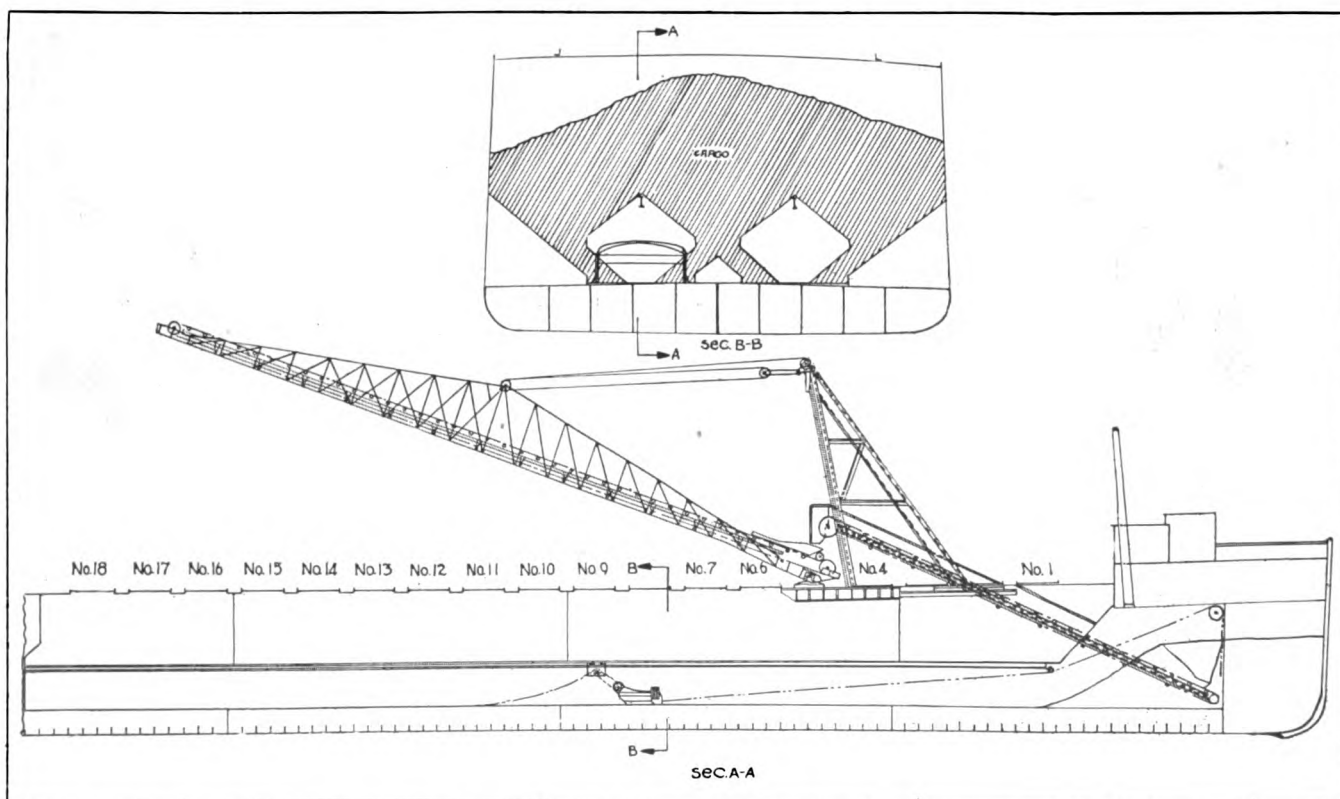
STEAMER ANDASTE, FIRST VESSEL EQUIPPED, DUMPING CARGO 75 FEET FROM THE SHIP

rumerous, wide hatches and, second, the tremendous iron ore, coal and grain loading and unloading plants with their remarkable ability to load or unload a 13,000-ton freighter in a few hours.

But a growing proportion of this raw,

bulky material calls either for loading or unloading at docks not specially equipped and where the volume of freight does not justify such expense. The stone carrying trade on the lakes is the most important example and for that

trade a fleet of self-unloading type vessels has been designed and built. Many of these have been in satisfactory service for years. In general, the cargo is dropped by gravity on to conveyors which carry it from the hold to the



PROFILE AND CROSS SECTION OF STEAMER FONTANA WITH SELF-UNLOADING EQUIPMENT INSTALLED

deck and on a swinging boom which drops the stone well on to the dock, 150 feet or more from the ship if desired.

These ships have been specially built for this service. The hoppers, which receive the cargo, are built into part of double bottom space, in order to lower the top of the hopper and permit the cargo to be carried lower. This, of

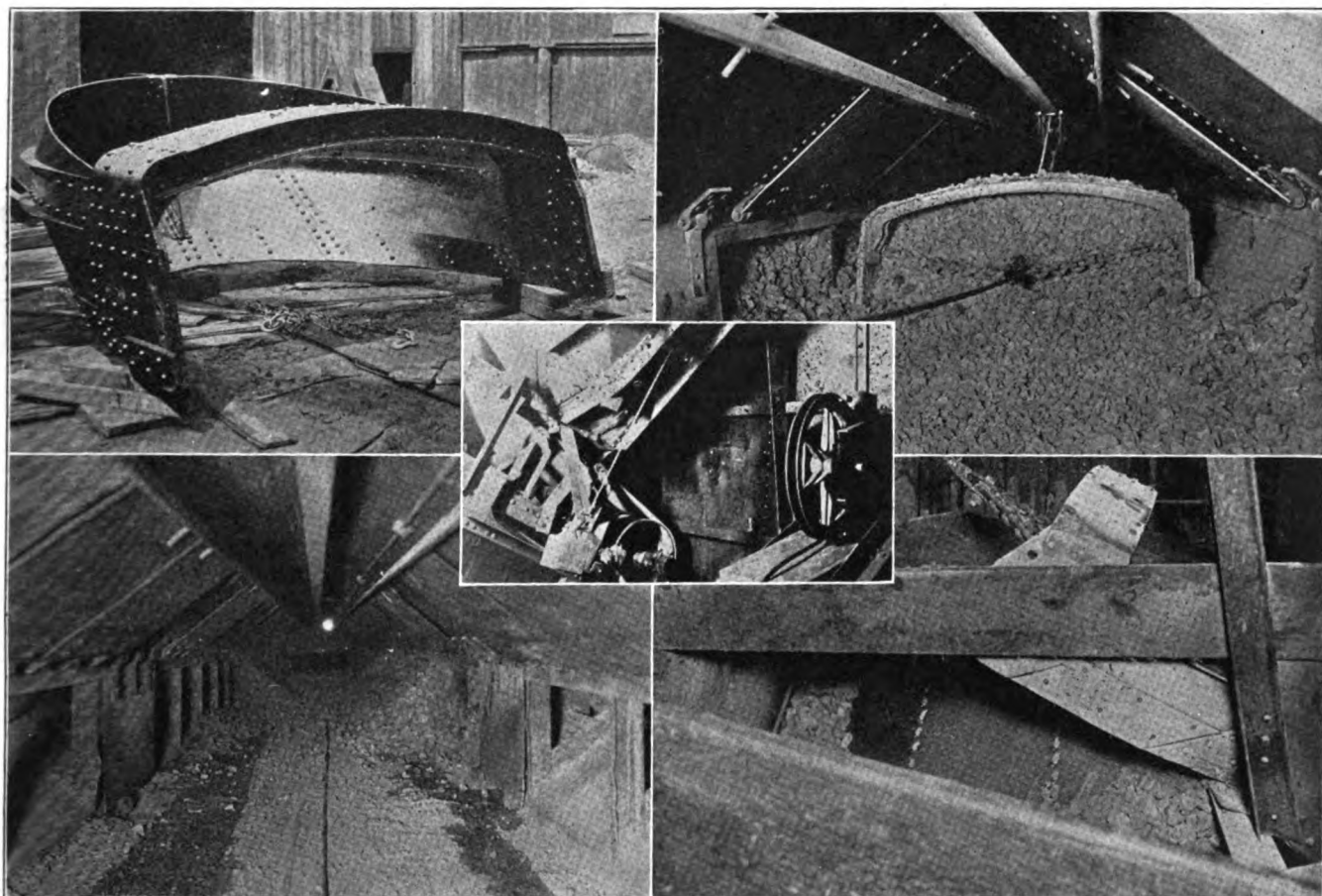
on to a conveyor for elevation to the deck and delivery to the dock.

The accompanying illustrations show clearly the design of this unloading equipment, the deck structures on several vessels now equipped, the unloading conveyor in service and the scraper in the tunnel.

Similar equipment has been specially

coal, sand, etc., available for handling by water carriers, will find it advantageous to use this service rather than pay higher freight rates for transportation by railroad.

This unloading system has several points of genuine interest to shipowners and dock operators. It is designed specially to permit the conversion of old



ABOVE, 8-YARD SCRAPER, LARGEST EVER BUILT, AND AT RIGHT SCRAPER SHOVING CARGO OUT OF TUNNEL. BELOW, ONE OF TWO CARGO TUNNELS FITTED IN EACH SHIP AND AT RIGHT, SCRAPER AT END OF PULL DUMPING INTO HOPPER. INSET SHOWS HOPPER DISCHARGING ON TO ELEVATING CONVEYOR

course, adds to the capacity of the ship and increases stability and safety. To offset the loss of this ballast space, side tanks are used. These ships have been highly satisfactory for such trade.

In the past few months, service tests have been made on the Great Lakes of another type of unloading rig. This equipment, developed and patented by Leathem D. Smith, president of the Leathem D. Smith Dock Co., Sturgeon Bay, Wis., uses a scraper which operates in a tunnel. Two of these tunnels are built on the tank top of the ordinary lake bulk freighter. Swinging side doors allow the cargo to enter these tunnels freely. Powerful hoists pull the scraper back, above the loose material, and then drop the scraper and pull it forward, shoving the cargo

designed for river boats and is interesting because it permits the river steamer to discharge at any point along the bank without regard to the location of docks. This was graphically illustrated a few weeks ago when one of the lake vessels entered a small stream from Lake Michigan, and dumped its load of highway stone directly on to the bank. Except for bushes and weeds, the bank was barren but it was close to the point of consumption for the stone.

Compared with the days of sailing ships when lumber was the big freight on the Great Lakes, only a handful of harbors are now used. Scores of harbors, once important, now rarely see a freighter. The backers of this unloading rig feel that plants in such ports, which can use materials such as stone,

vessels. Many lake bulk freighters have become uneconomical because their capacities of 3000 to 6000 tons compare unfavorably with the 12,000 and 13,000-ton freighters now being customarily built. This system has been installed on lake freighters of from 2500 to 6000 tons capacity and gives such vessels a renewed opportunity for meeting a trade demand for which they are specially suited.

Another interesting feature is the ability to unload any class of bulk commodity where desired. Shore plants which have insufficient demand for freight coming in by water to justify high dock investments can take advantage of the lower water freight carrying cost by utilizing a freight service which provides its own unloading means.

The designer in calling attention to

some of the advantages of this method points out that nonfree-flowing materials can be handled whereas only free-flowing materials are now handled; the center of gravity is lowered permitting installation without the question of stability being introduced. The unloading speed runs up to 500 tons an hour, on the FONTANA, the largest installation, the scraper making a round trip a minute. Two men unload a steamer, one to each tunnel, so that each has his tunnel in full view.

Leathem D. Smith, president of the Leathem D. Smith Dock Co., Sturgeon Bay, Wis., designed and patented this subcargo unloading apparatus. The problem came to his attention because of his active connection with the business of stone quarrying which led to his entrance into the lake transportation field in order to obtain wider and more certain distribution of his stone. His Sturgeon Bay plant, during the war, engaged in ship construction work for the government and is now equipped for ship building and repairing. This training in both the stone trade and in vessel design and construction well fitted Mr. Smith for study and solution of the problem of unloading bulk freight from the holds of vessels.

This equipment has been designed and installed up until this time in two standard sizes. In the smaller ships of 2000

to 3000 tons deadweight with cargo holds up to 150 feet in length, bottomless drag scrapers of 4 cubic yard capacity are used in the two longitudinal subcargo tunnels. These scrapers are each handled by double drum steam hoists having a line pull of 16,000 pounds on the load cable and about 8000 pounds on the back haul cable.

The hoists are placed at the forward end of the ship on the tank top alongside the foot of the scraper incline. By this arrangement, the bucket operation at all times is visible to the operator. The scraper is pulled back in the tunnel by the back haul cable which leads to the after end of the ship under side or center cargo drain slopes. The cable comes up the tunnel and is rove through an overhead trolley on an I-beam through a sheave on the back of the scraper and dead-ended on the trolley.

This reave of cable lifts the returning light scraper up over the cargo which flows into the tunnel from both sides. Slacking the back haul cable lowers the scraper on to the material. The load cable then pulls the scraper forward and shoves the material up the scraper incline into the hopper which feeds the inclined belt conveyor.

In connection with the 4-yard scrapers, a 40-inch inclined troughing conveyor belt and a 36-inch swinging boom conveyor are used. This size installation

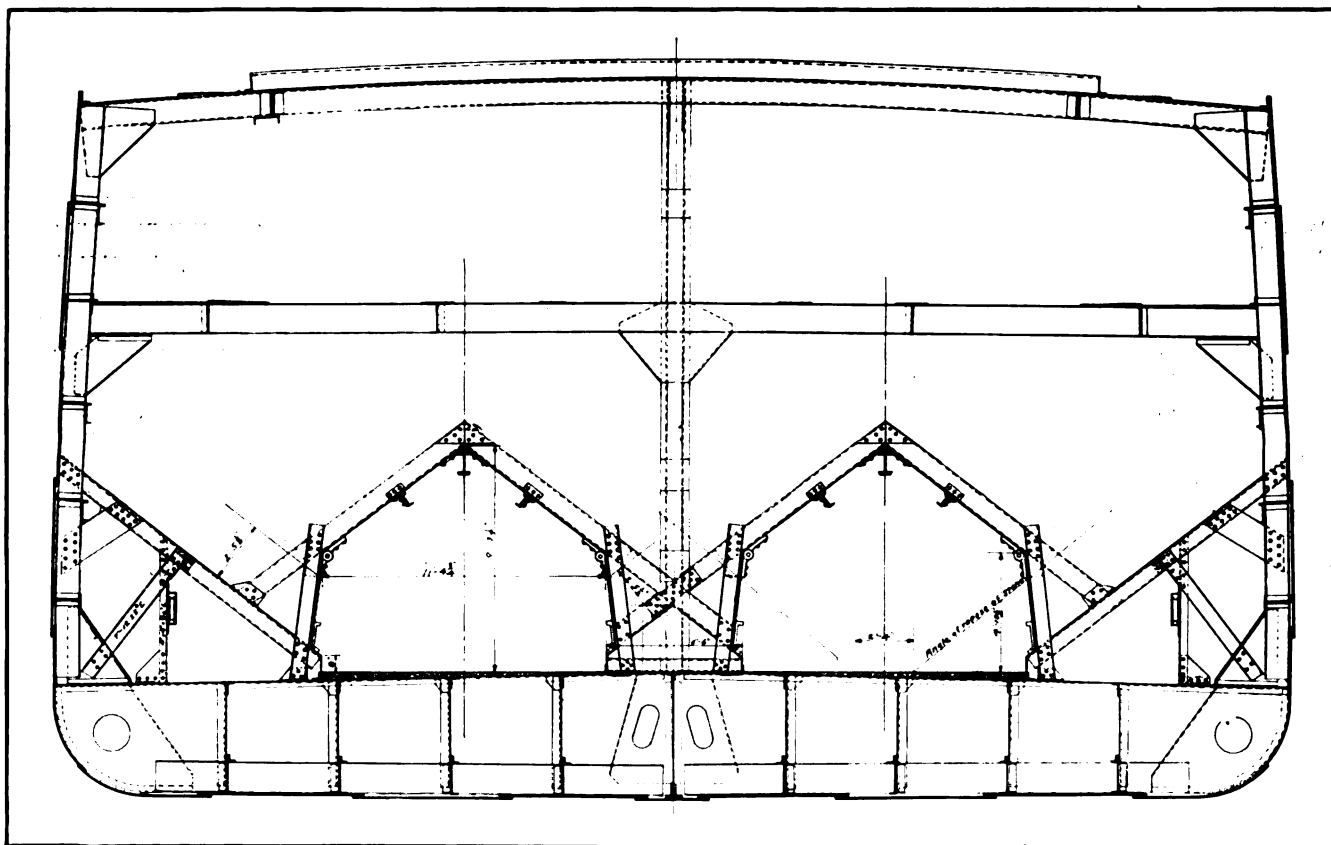
has given an actual average rate of unloading of coal and stone of 300 tons an hour.

In the larger type of ships, ranging from 3000 to 6000 tons deadweight capacity with cargo holds from 150 to 250 feet in length, scraper buckets of 8 cubic yards capacity are used. These are the largest ever built and will hold 10 tons of stone or 6 tons of coal. This requires a cable line pull of 25,000 pounds and about 10,000 pounds on the back haul cable. The speed of the loaded scraper runs from 200 to 250 feet per minute and the maximum back haul speed from 400 to 500 feet per minute. The same arrangement of equipment is used in both sizes, of unloading rigs. With the 8-yard scrapers, a 54-inch incline conveyor belt and a 48-inch boom belt is used.

The average stone and coal unloading rate of these ships is 500 tons an hour, the doubled capacity of scrapers being partially offset by the longer average haul of the materials in the tunnels. The maximum unloading rate has been found in service to be double the average rate.

The swinging doors installed in the tunnel side openings permit selective unloading of cargo from various compartments as desired.

Many special features of design in parts of the equipment have been worked



COMPLETE TUNNEL CROSS SECTION ON STEAMER FONTANA



SERIES ILLUSTRATES HOW CARGO IS HANDLED FROM THE DECK TO THE DOCK

out by experiment and operation to increase speed and smoothness and to reduce operation and maintenance expense.

From observation and from data at present available, the designer asserts that the operation and repair and maintenance expense will be less than the standard all pan conveyor type of unloaders and will about equal the all-belt conveyor type.

Some of the main advantages of the apparatus are based on bringing the point of feed down to the cargo floor of the ship. This arrangement results in the

following claims being advanced for this type of unloader:

1—Saving of from 60 to 70 per cent of the cubic space lost in conveyor ships.

2—Continuous gate opening in sides of tunnel permits handling many nonfree-flowing materials, such as sand, not possible to feed through restricted gate openings.

3—Steeper angle of scraper incline forward compared with conveyor gives greater cargo space and permits elevating material with 20-degree inclined conveyor. Use of this conveyor permits the

use of means for weighing cargo as discharged.

4—Cargo being carried on the tank top or ship's cargo floor lowers center of gravity of cargo between 3 and 4 feet compared with the hopper-type conveyor ship making it possible to convert safely the standard bulk freighter with its deep water bottom tanks. This greatly reduces the first cost of unloader ships by utilizing the smaller ships which have become obsolete in the bulk carrying trade.

The four vessels which have been

fitted with this unloader are the FONTANA, a 6000-ton carrier, formerly the R. W. ENGLAND, which carries a 150-foot boom; the ANDASTE, a 2500-ton carrier, with a 75-foot boom; the whaleback BAY STATE, formerly the COULBY, a 2500-ton carrier with a 75-foot boom, and the whaleback CLIFTON, formerly the MATHER, a 3500-ton carrier, with a 100-

foot boom, which ran into a terrific gale on Lake Huron in September and was lost.

The Progress Steamship Co. owns the FONTANA and BAY STATE and last winter had these vessels and the CLIFTON converted to unloader type at the plant of the Leathem D. Smith Dock Co., Sturgeon Bay, Wis. The Leathem D. Smith-

Cliffs Co. equipped the ANDASTE, the first carrier to be refitted. The vessels are operated under the management of the Cleveland-Cliffs Iron Co., Cleveland, and William G. Mather, S. Livingstone Mather and A. E. R. Schneider of that company are interested with Mr. Smith in the fleet and in the unloading equipment and service.

Why Not Do It, Mr. O'Connor?

Behind the Scenes at the Shipping Board—Verbatim Extracts from Sworn Testimony of the Gentlemen Who Are Spending Our Money Playing at Ship Operation

*From the Proceedings of the House Committee
Sitting in Washington, March-June, 1924*

Ewin L. Davis, *Congressman from Tennessee*—If I understand you, your view is instead of publishing to the world that this whole business is a failure and we must get rid of it, that we must sink the ships or scrap them, and all that sort of business, the way to do is to commence talking the other way and saying we are going to maintain these lines and render this service for at least a definite period of time?

T. V. O'Connor, *Chairman of the Shipping Board*—I believe in the scrapping of the ships; that we should go into the immediate scrapping of about 350 or 400 of them.

Mr. Davis—That is out of 1200?

Commissioner O'Connor—Yes.

Mr. Davis—What is the difference in the current expense, we will say, per month, of the maintenance of a laid-up ship and the maintenance of a spot ship ready for service?

Mr. O'Connor—The spot ship has what we call a "skeleton crew," and a few sailors. Her expense runs quite high, up to probably \$1200 a month. The laid-up ship runs about \$140 a month at the present time.

Henry A. Cooper, *Congressman from Wisconsin*—You say you have 1200 ships, and could sell 300 and still have a sufficient number remaining?

Commissioner O'Connor—We have close to 1400.

Mr. Cooper—You have close to 1400?

Commissioner O'Connor—We could scrap 400 and have 800 good ships. Is not that the answer you wanted?

Mr. Cooper—It is not the answer I wanted, particularly; I simply want your judgment.

William B. Bankhead, *Congressman from Alabama*—In connection with Mr. Cooper's last question, the shipping board, under the existing law, has the absolute power to scrap these obsolete ships, has it not, Mr. Chairman?

Commissioner O'Connor—I think we have.

Mr. Bankhead—Why don't you do it?

Commissioner O'Connor—Fine; that is the way I like to hear you talk. Sentiment has kept us back.

Mr. Bankhead—What sort of sentiment?

Commissioner O'Connor—Public sentiment.

Mr. Bankhead—Is your board actuated by public sentiment or business judgment?

Commissioner O'Connor—Well, by public sentiment to some extent. We have been waiting to see what would come out of this whole thing. I believe every member of the shipping board wants to scrap those ships.

Mr. Bankhead—How much longer are you going to wait on this matter of public sentiment before you take some definite action on that program which appeals to your business judgment?

Commissioner O'Connor—I was not letting public sentiment interfere; I had it up today at noontime. [This was in April, 1924. The ships are not yet scrapped—Ed.]

Mr. Bankhead—The maintenance of those obsolete and useless ships involves quite a large part of your overhead expense, does it not?

Commissioner O'Connor—Quite a lot of expense. It runs up, I imagine, to about \$140,000 a month. I am of the opinion there are 400 of them that could be done away with without even missing them.

Mr. Bankhead—Do you think you will determine that question of the ultimate disposition of that type of vessel at an early date?

Commissioner O'Connor—Yes; I do.

Mr. Bankhead—What are you going to recommend?

Commissioner O'Connor—That there be 175 taken right out.

Mr. Bankhead—What do you propose to do with them?

Commissioner O'Connor—Scrap them.

Mr. Bankhead—What price do you think you can get per ton for those 175 ships as scrap, now?

Commissioner O'Connor—For scrapping, I think that we could get \$3 a ton.

Mr. Bankhead—Do you think it would be good business to sell them for \$3 a ton?

Commissioner O'Connor—I do not see anything else to do with them.

Mr. Bankhead—I do not either; that is the reason I am asking you. It seems to me it is rather poor business, after the board has definitely reached a decision that they are of no value and never will be of any value to us or to our commerce, to keep them perpetually, at the expense of running up your overhead charges.

Dock Management Progress Section

How Successful Dock Operators Have Met
Problems of Giving Best Service to Ships

Meets Needs of Fast Liner Service

BY HERBERT R. SIMONDS
Associate Editor at Boston

THE old boat is late again." This is a frequent remark heard on steamship docks when the office boy bursts into the dock superintendent's office in the morning. Passenger boats as a rule are kept quite close to schedule in sailing, but freight ships are subject to more frequent delay. Even in the case of combination passenger and freight ships, it is almost impossible for the man in charge of handling the freight to plan his schedule strictly by the clock. This is one of the differences between handling material on a dock and handling it at a manufacturing plant. Another peculiarity comes through the tendency of most shippers to deliver freight to steamship docks about five minutes before the scheduled departure

of the vessel. Visit any dock where considerable freight is handled, and you will find a great rush of trucks trying to unload at the last minute, freight which must get on the ship. The problems of meeting these emergencies which, however, come with such regularity as to scarcely be classed as emergencies, are solved by different companies in various ways.

When the demand on an electric motor is fairly constant but subject to periodic high peaks, it is economy to buy a motor designed for efficient operation under the average conditions and still able to take care of the peak load. Similarly, it is advisable to design the handling equipment on a steamship dock efficiently to care for the average run of business and

then to have spare hand trucks or other apparatus to take care of the times of unusual stress.

On the line between Boston and New York, two new combination passenger and freight ships make daily runs through Long Island sound and the Cape Cod canal. While these vessels keep fairly close to schedule during most of the season, there are times in the fall when heavy fogs disturb schedules and the ship due at Boston, for instance, at seven o'clock in the morning may be several hours late. When this is the case, its full cargo must be taken off and the return cargo loaded in much shorter time than usual so that the five o'clock hour of departure in the evening may be met.

In order to take care of emergencies



FIG. 1—PACKAGES OF MISCELLANEOUS FREIGHT ARE TRANSFERRED FROM TRUCKS DIRECT TO TRAILERS WHICH ARE LATER FORMED INTO TRAINS AND HAULED ABOARD



FIG. 2—AN ELEVATOR ABOARD SHIP QUICKLY TRANSFERS ITS LOAD OF TWO TRAILERS BETWEEN THE HOLD AND THE 'TWEEN DECKS



FIG. 3—NEARLY ALL FREIGHT IS HAULED DIRECTLY TO ITS FINAL LOCATION ON BOARD SHIP BY SMALL TRACTORS

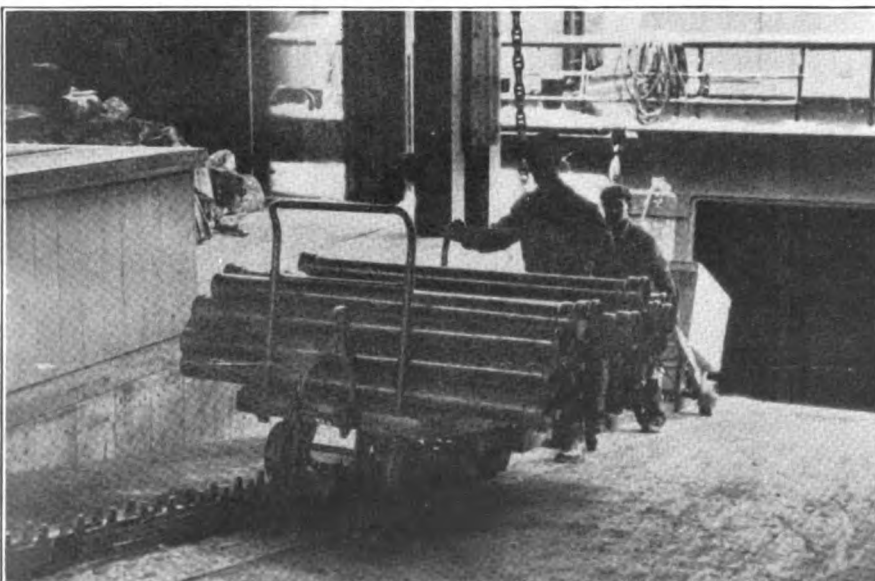


FIG. 4—TRAILERS AND HAND TRUCKS ALIKE ARE ASSISTED UP STEEP INCLINES BY THE ESCALATOR

and at the same time have an efficient method of handling freight under normal conditions, a new system of industrial tractors and trailers has been installed on the docks of the Eastern Steamship Co., Boston, operator of the above fast steamers, and has met with unusual success. The nature of the equipment used may best be studied by an account of a normal day's operations. It should be said at first, however, that regardless of the equipment, successful handling of material depends to a large extent on the work of the dock superintendent or of the man in charge of the freight.

Each day at the Boston dock, an

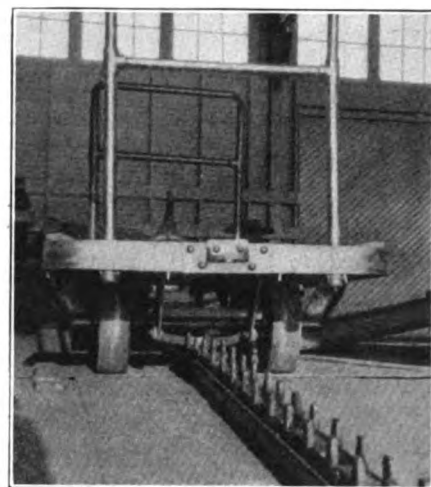


FIG. 5—IN WET WEATHER, AT HIGH AND LOW TIDE, A POWER DRIVEN ESCALATOR GANGPLANK IS USED

average of 500 tons of miscellaneous freight is handled. A visitor during the rush period between three and five o'clock in the afternoon is amazed at the rapidity with which large piles of boxes, crates and barrels on the dock melt away through the activity of the long trailer trains which run on and off of the ship. Because of the variety in the character of freight, no definite system of loading can be followed. Some days, the freight will be light consisting of textiles, furniture, mattresses, etc., and the next day a run of machinery, boxed paper, molasses, and sugar may double the average weight for a given space. It is these variations that tax the ingenuity of the men in charge of loading, for it is not enough merely to get the material on to the vessel, but it must be placed on the proper deck and in a way to give the proper trim to the ship both fore and aft and laterally.

The vessels with which this article is particularly concerned are sister ships 402 feet long, 72 feet 6 inches beam, and 5450 tons displacement. They are designed to carry 690 passengers and have about 90,000 cubic feet of freight

space. Main deck at midtide comes approximately at the level of the dock and freight is taken aboard through three ports. The freight destined for the hold is carried on to an elevator which is part of the ship equipment, and which drops down some 24 feet to the floor of the hold.

Formerly this freight, handled largely by hand trucks, could not be moved rapidly enough. The new system of trailers and truck tractors not only shows a marked saving in handling cost under normal conditions, but what is even more important, a capacity for speeding up under stress to two or three times the average loading rate.

At Boston, freight is brought to the dock by truck from points throughout eastern New England. The approach to the dock is such that the bed of the average motor truck comes approximately 18 inches above the dock platform which is an excellent height for transferring boxes and packages from the truck to small trailers. The general scheme of handling freight is to unload directly from trucks to trailers, which trailers when the vessel is not in or is unloading, are used as storage space.

The equipment includes some 100 of these trailers with a combined capacity for the average run of freight of 75 tons. This total capacity, of course, is not usually available for storage pur-

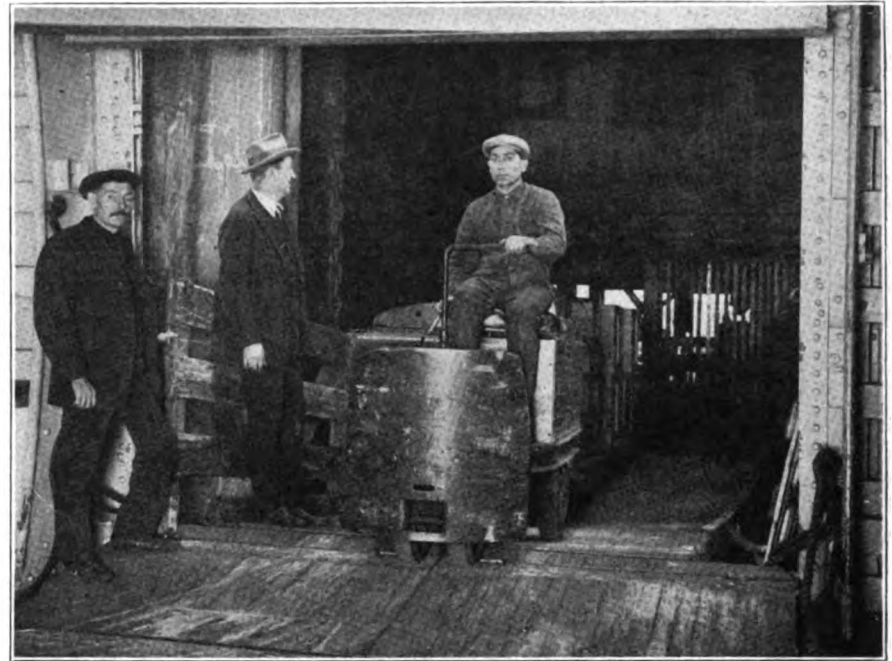


FIG. 7—TRAINS OF FOUR AND FIVE TRAILERS ARE SUCCESSFULLY HANDLED AT MIDDTIDE

poses as some of the trailers are needed for unloading.

Under normal conditions, when the boat arrives early in the morning, the general procedure is as follows: A detail of 12 men with two industrial tractors is assigned to the work of un-

loading. Of these 12, seven are employed on the main deck and five in the hold. The trailers loaded with freight in the hold are pushed on to the elevators by hand, carried up to the main deck, and here are picked up by one of the tractors and hauled out to the space at

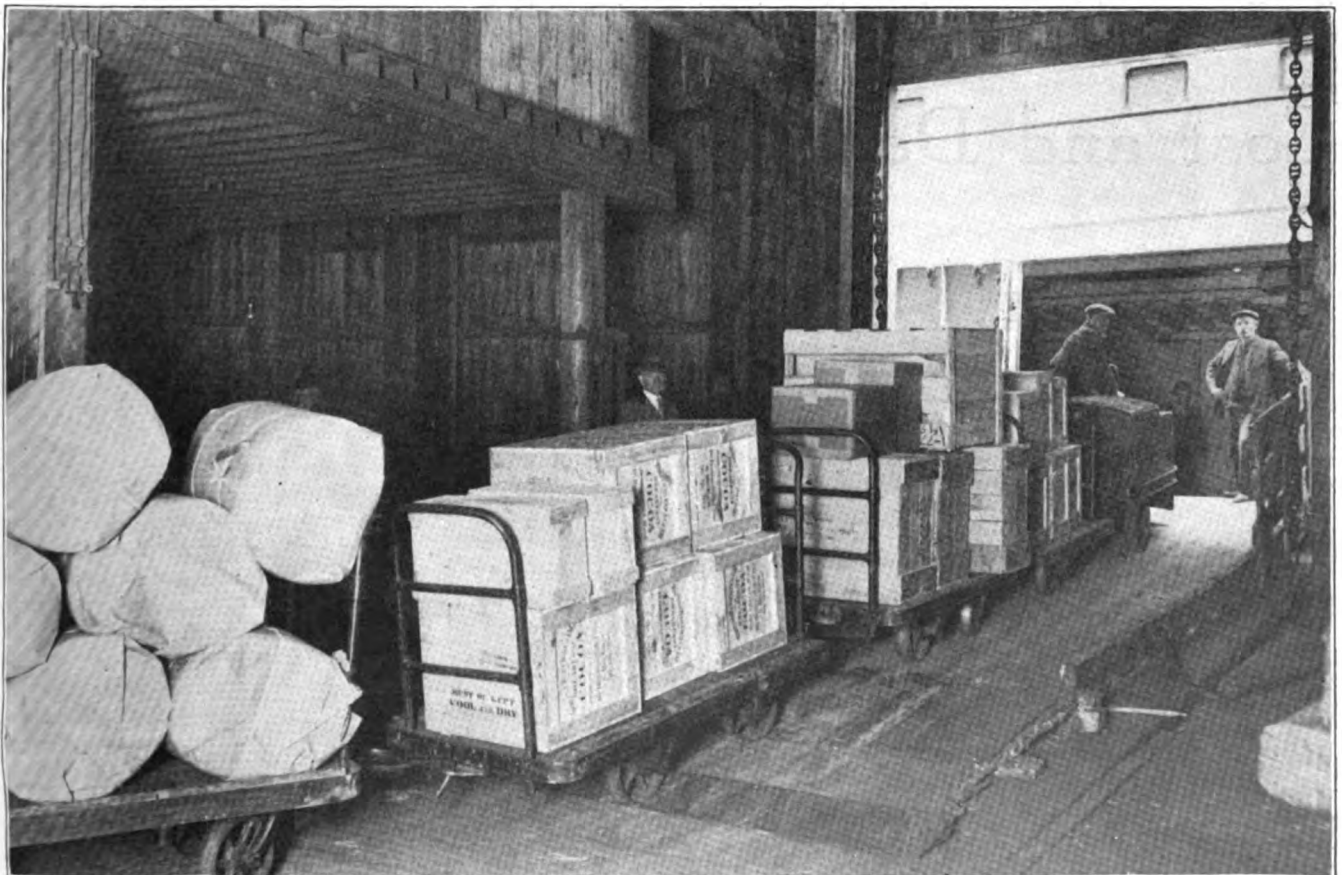


FIG. 6—FREIGHT VARIES FROM LIGHT BUNDLES OF WOOL TO HEAVY BOXES OF PAPER OR OF CANDY

one end of the dock which is reserved for incoming freight. Deck freight is loaded on to trailers and is picked up by a tractor at the point of loading.

Three or four of the trailers are coupled together to form trains and the average distance of travel of these trains from point of loading on the boat to point of unloading on the dock is 200 feet. From 30 to 40 trailers are reserved for unloading the boat. The balance of the trailers are kept at the receiving end of the dock ready to take freight directly from motor trucks.

The ship elevator at the main deck level is shown in Fig. 2. Here two trailers loaded with freight have just been sent up from the hold and are now being picked up by the tractor which will run them out to the incoming freight section of the dock.

Outgoing freight is handled in a similar way in the reverse direction. A corner of the outgoing freight section of the dock is shown in Fig. 1. Operations at this point are fairly continuous throughout the day with a rush period coming each afternoon from three to five. Trailers, loaded directly from motor trucks, are placed so that they can be easily picked up in train form by the tractor. Two tractors are kept busy throughout the day and a third, normally held in reserve, is used during rush periods.

After three o'clock in the afternoon, 19 or 20 men are used for loading under the present system. These are distributed

as follows: six loaders on the dock, two tractor operators, one hooker-on on the dock, six unloaders and pilers on the main deck, one elevator man on shipboard, and three pilers in the hold. These men with two electric tractors frequently handle 150 tons of miscellaneous freight from the trucks to final position on the boat between the hours of two and five in the afternoon. It is only when the boat is delayed in starting, due to an unusual rush of freight that the third tractor is called into service. This third tractor, however, is frequently used for miscellaneous work such as shifting the heavy gang planks from one part of the dock to another.

Tractor Places Freight

Details of loading are worked out so that practically all the freight on the main deck is taken directly to its proper location by the tractor train. A short wheelbase on the tractor facilitates this placing of freight on deck. Fig. 3 is a 'tween deck view about midships illustrating how the small tractor winds in and out among the various obstructions, and finally backs its load just where it is wanted.

Varying tides encountered along the Atlantic coast offer something of a handicap to any transportation system. As the difference in level between the dock and deck becomes greater, the train loads which are hauled up grade must be shortened, although when the grade is in the

direction to favor the movement of freight, the train lengths are not altered.

The best arrangement of levels naturally is to have the dock come opposite the deck at a time midway between high and low tide. This, as stated, is the case at the Eastern Steamship dock, and this means that the incline of the gangplank never exceeds one half the total difference in elevation between high and low tide.

The tides, however, vary, and during wet weather the gangplanks become slippery. At such times, a special gangplank provided with a power driven endless escalator chain is used. The trailers are equipped with brackets front and back which engage the lugs of this chain as shown in Fig. 5. Fig. 4 shows the escalator carrying a heavy load of pipe up a steep incline. A hand truck may also be seen in this view using the escalator. When the old system of hand trucks was discarded, many of the trucks were kept to use in emergencies or to fill in as required.

The great diversity in character of freight shipped from Boston means that some care must be exercised in loading not only the boat itself but the individual trailers. Paper, for instance, comes in boxes weighing about 600 pounds each, and the bulk of these is so small that the trailers could be easily overloaded. It is customary to place three such 600-pound boxes on each trailer and then to fill up the remaining space with lighter material.

Cost and Design of Floating Fenders

BY H. W. ORDEMAN

OWING to the narrow stringpieces on a majority of piers in New York harbor, sufficient space is not available between shipside and pier to handle cargo drafts when a ship is hard against the pier. The difference in elevation between ship deck and passenger deck of the pier may also make the gangway angle too great for safety.

To afford working space for cargo drafts and for handling passengers, the ship must be breasted or fended off the pier. This is accomplished by means of fenders, of which there are three classes; permanent fenders, breasting spars, and floating fenders.

Permanent fenders are generally pile clusters extending three to five feet from the pier and lashed to the pier by chain or cable. This type of fender is of advantage where there is an overhead or

permanent obstruction on the pier shed that might engage the bridge or lifeboats of a ship. For cargo handling, the permanent fender is not advisable as it cannot be readily moved to accommodate ships of various lengths. The surface presented to both ship and pier is small, the pressure being exerted over a quite small portion of the pier which tends to loosen up the pier substructure in the vicinity of the permanent fender.

Breasting spars are constructed of either wood or steel in lengths up to 60 feet. One end may be fastened to the pier by means of a rocker and pin so that when not in use, the spar may be secured against the side of the superstructure. Since the bearing surface on the end is small, a wood or metal wall plate is inserted between the fender and ship to distribute the pressure over several of the ship's frames. With one end permanently fastened to the pier, this type has all the disadvantages of a

permanent pile fender. In breasting a distance of more than 15 feet, portable breasting spars are used for the actual breasting off. This is done so lighters may be worked between the ship and pier, the lighters when in place, acting as floating fenders.

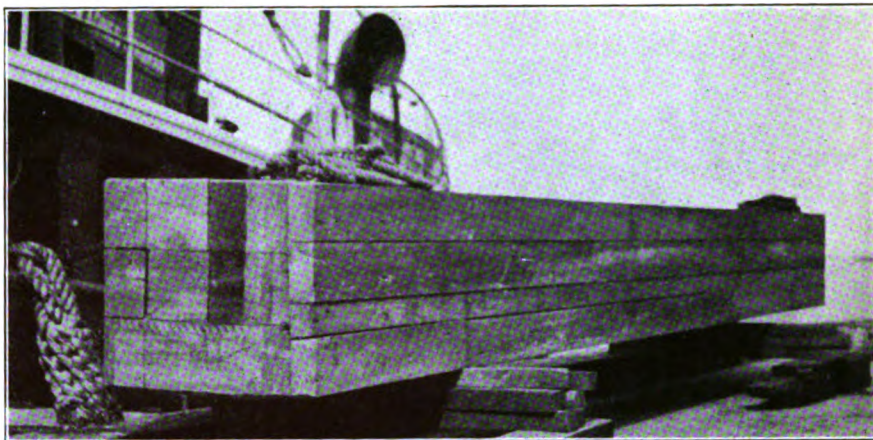
Floating fenders are either single sticks or built up floats, depending on the width used, secured to the pier by lines. Up to two feet in width, single sticks are used, while the larger fenders consist of 12 x 12-inch timbers fastened together with through bolts. They may be easily moved and when properly constructed furnish ample bearing surface for the ship, distributing the pressure over several bents on the pier.

The standard distance between pile bents being 10 feet, floating fenders should be long enough to engage at least three bents. The overall length of three bents would be 20 feet but as slack must be left in the mooring lines

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to accommodate tidal changes, the fender should not be less than 24 feet in length to insure contact at all times. For large ships, the length may be increased to 34 feet. No advantage is secured in constructing a fender more than 34 feet in length unless the bent spacing is greater than 10 feet. Even then it may be advisable to use three short fenders in place of two long ones. If a shorter length than 24 feet is used, there is a possibility of a ship's plate catching the fender on one end and shoving it between the bents or else breaking off bearing piles in the substructure.

For widths of three to five feet, the depth of fender should be three feet and the construction solid. For widths over five feet, the depth should be 60 per cent of the width. On the large fenders, skeleton or framed courses reinforced with ship knees and intermediate bracing may be used, but unless the work-



SOLID FENDER READY FOR LAUNCHING

of long leaf yellow pine with middle courses of Douglas fir. The fir adds buoyancy to the fender and has a greater compressive strength perpendicular to the grain than the yellow pine. It

2-inch yellow pine or spruce nailed horizontally to protect the large timbers from chafing round on the edges.

Bolts used for fastening the timbers should not be less than one inch in diameter. A dock department washer is used on each end, countersunk so that bolt ends and nuts do not extend outside of the timber face. Mooring line bolts should not be less than one and one-half inches in diameter with a welded eye and ring.

In place of using washers on the mooring line bolts, use a 6-inch square plate on each end. Straps and bands around the outside of the fender are not advisable as they are soon torn off by ship plates.

Before launching, paint the ends of the fender with a creosote preparation and give the bearing sides a coat of rack grease.

The accompanying table gives the approximate cost of floating fenders without mooring lines.

What Floating Fenders Cost

Width feet	Depth feet	Length feet	Construction	Mooring Bolts	Cost
3	3	24	solid	2	\$465.00
3	3	34	solid	2	615.00
4	3	24	solid	2	555.00
4	3	34	solid	3	730.00
5	3	24	solid	2	680.00
5	3	34	solid	3	930.00
6	4	24	2 courses framed	4	1015.00
6	4	34	2 courses framed	5	1435.00
8	5	24	3 courses framed	4	1230.00
8	5	34	3 courses framed	5	1740.00

manship is good they will soon loosen and collapse.

Solid fenders of three feet depth should have the top and bottom courses

is not advisable to use fir for top and bottom courses as it is brash and splinters easily. The bearing surface of all floating fenders should be covered with

How Governor Controls Diesel Speed

RACING of any engine is due to a decrease or total cessation of the load under which the engine is operating. It is clear, of course, that energy must be expended by any engine in proportion to the load under which it works. There is, therefore, a distinct loss of energy when an engine races. Of greater importance, however, is the serious damage which constant recurrence of racing may cause to the structure of the engine and to the shafting and propeller or generating unit to which it is connected.

A really practical governor working on correct principles is, therefore, of the greatest importance in connection with the proper operation of any engine and particularly so for a diesel engine. Governing marine diesel engines can be effected by regulating the fuel

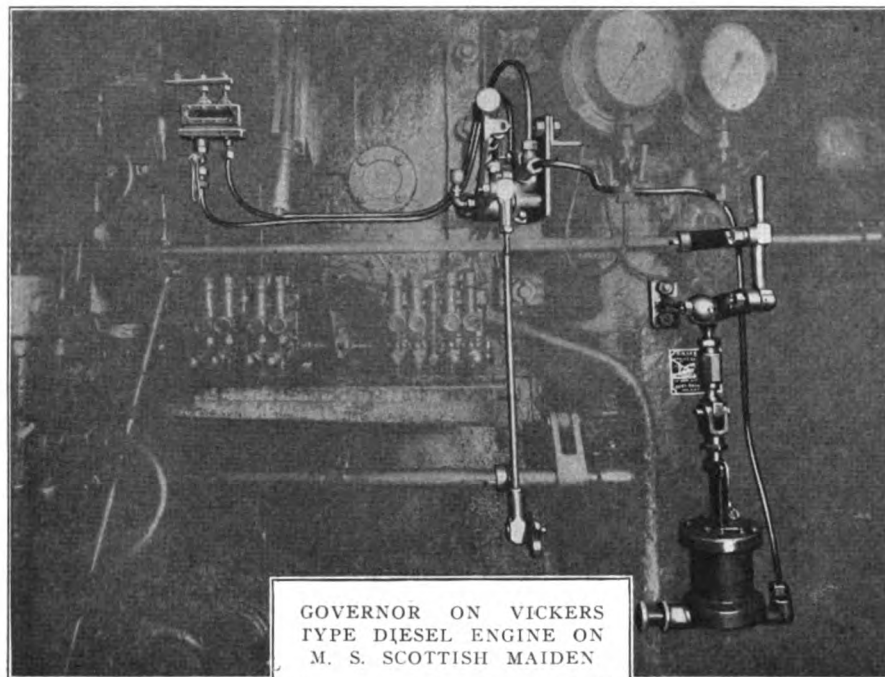
supply to the cylinders. Such a device, known as the Ramsay governor, has been developed and applied with success to a number of diesel engine vessels in England, and is now being introduced in the United States by Chas. Cory & Sons, Inc., New York. This governor has been used on both 2 and 4-cycle diesel engines in Europe of the following types, Vickers, Sulzer, Neptune, Werkspoor and Cammellaird-Fullager. In this country, the Ramsay governor has been adopted as standard equipment by the New London Ship & Engine Co., for all its marine diesel engines.

The accompanying line drawings Figs. 1, 2 and 3, show respectively the anticipating valve, speed device and power cylinder, of this governor. It is the function of the governor to regulate the fuel supply so that less fuel will go to the cyl-

inders of the engine in order to keep the revolutions down to normal, when the load is reduced. This is accomplished by a positive and powerful displacement of the piston shown in Fig. 3, under the impulse of compressed air.

The piston is almost invariably connected by the yoke of the rod to the suction valves of the fuel oil pump, but if desired it can also be applied to any other method of controlling the fuel supply. The air for operating the governor, obtained directly from the starting or maneuvering air tanks, is reduced to about 100 pounds per square inch in pressure.

Control of the admission of air to the cylinder for actuating the cut-off mechanism of the fuel pump is accomplished independently by either of the parts of the apparatus shown in Figs.



1 and 2. It is of course in these portions of the device that the ingenuity and especial value of the Ramsay governor lies, though the relay principle of transmitting power is of great importance in relieving the sensitive controlling mechanism from any undue strain. The distinctive features are: first, that it is capable of two impulses per revolution of the engine when it speeds up, admitting air to the cylinder for actuating the cut-off mechanism of the fuel pump; second, that it will act to reduce the fuel supply in advance of the speeding up of the engine when the ship pitches and before the propeller is out of water and by the same token restore the supply

before the wheel is fully immersed again. It is, therefore, particularly suitable for maintaining continuously the proper engine speed without sudden checking or release.

Concentrating on the first of these features, the weight shown in Fig. 2 is oscillated back and forth by means of springs actuated by a mechanism connected to some moving part of the engine or of any attached gear that reciprocates to the same time. When the amplitude of the oscillations of the weight sufficiently increase under the impulse of increased speed of the engine so that the lever arm of the weight comes into contact with both of the set screws *S* in

turn, the rocker arm to which they are attached opens a valve and air will flow in the tube in which this valve is set. Thus each blow of the weighted lever will cause an air pressure to be set free in the tube in direct proportion to the speed.

This air pressure is communicated to the power cylinder shown in Fig. 3 for actuating the cut-off mechanism of the fuel supply. The air first passes through a small spring controlled pilot valve which allows a part of the actuating air to escape into the atmosphere, but in so doing this small valve is partly closed and the remainder of the air is applied to moving the piston of the power cylinder which in turn cuts off the fuel supply. As soon as the fuel supply has been reduced sufficiently to maintain normal speed, the pilot valve returns under action of its spring to its original position, allowing the air in the cylinder to escape. The tension in the spring of the pilot valve can be regulated to suit, within limits, any desired travel of the pilot piston, which in turn will automatically control the stroke of the power cylinder.

An emergency locking device connected to the weight level, shown in Fig. 2, shuts off the fuel supply when extra high speed of the engine, such as would occur on the loss of a propeller or a broken shaft, causes the weight to strike heavy blows on the set screws actuating the air supply valve. By means of this emergency device, the weight lever is locked constantly in the operating position, keeping the air valve open. The engine is thus stopped automatically, preventing possible serious damage. For all ordinary speed variations, though of

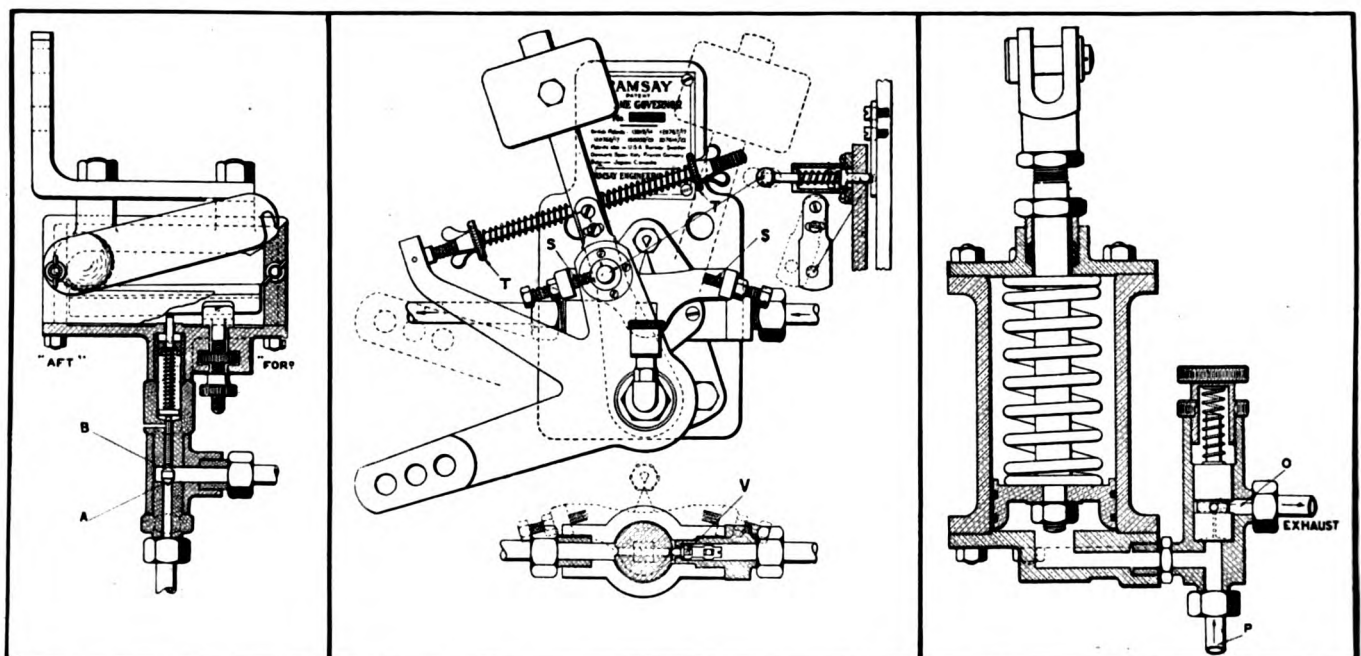


FIG. 1—MOVEMENT OF BALL THROUGH PITCHING OF SHIP ANTICIPATES AND CONTROLS SPEEDING OF ENGINE. FIG. 2—HOW FUEL SUPPLY IS CONTROLLED. FIG. 3—POWER CYLINDER FOR ACTUATING CUT-OFF MECHANISM

considerable degree, an even regulation is maintained by the normal operation of the governor. Under regular operating conditions the governor will respond to an over speed of 3 per cent.

The second feature is one of special interest, that is, in anticipating the speed of the engine. When a ship is running in a heavy sea, pitching as well as rolling takes place. This pitching, if severe, will bring the propeller out of the water and so cause speeding up of the engine. In a twin screw vessel, rolling as well as pitching will cause the propellers to come out of the water.

The anticipating feature of this gov-

ernor, as shown in Fig. 1, consists of a balanced valve operated by a ball which is free to roll in a fore and aft direction. In vessels of the twin screw type, the anticipating valves are set at a small angle to the center line of the ship to take care of the conditions which obtain when one propeller is clear of the water. As the ship pitches and before the propeller comes out of the water, the ball rolls in the direction of inclination. The normal position of the track on which the ball rolls is adjusted to suit the trim of the vessel, so that the ball will remain at the aft end of the track, and not affect the valve until

pitching or rolling causes the track to assume an inclination forward. The ball in rolling to the forward end opens a needle valve and by-passes air to the power cylinder independent of any action of the oscillating weight, that is, the anticipating valve will begin to function before there is any actual speeding up of the engine.

When the ship has righted itself, the ball in this valve rolls aft, the vent in the pilot valve shown to the right in Fig. 3, lets the air escape and permits the piston of the power cylinder to come back to normal position, restoring the regular fuel supply to the engine.

Ocean Freight Rates

Per 100 Pounds Unless Otherwise Stated

Quotations Corrected to Dec. 22, 1924, on Future Loadings

NOTE: FREIGHT RATES STEADY WITH SOME DECREASE FOR GRAIN

New York to	Grain	Provisions	Cotton (H. D.)	Flour	General cargo cu. ft.	100 lbs.	††Finished steel	REMARKS Freight Offered	From North Pacific Ports to	Lumber Per m. ft.
Liverpool....	2s 9d†	\$0.50	\$0.30 to 0.35	\$0.21	\$0.40	\$0.75	\$7.00T	Fair	San Francisco.....	\$5.00
London.....	2s 6d†	0.50	0.30	0.22	0.40	0.75	7.00T	Fair	South California.....	5.00 to 6.00
Oslo.....	\$0.22	0.45	0.50	0.27	0.42½	0.85	8.00T	Fair	Hawaiian Islands.....	9.00 to 10.50
Copenhagen...	0.20	0.45	0.40	0.26	0.42½	0.85	8.00T	Good	New Zealand.....	11.00 to 13.00
Hamburg....	0.13	0.35	0.35	0.20	0.37½	0.75	8.00T	Fair	Sydney.....	10.50 to 12.50
Bremen.....	0.15	0.35	0.45	0.20	0.37½	0.75	8.00T	Good	Melbourne-Adelaide...	11.00 to 13.00
Rotterdam and Amsterdam.	0.14	0.32½	0.40	0.20	0.35	0.70	7.50T	Good	Oriental Ports.....	8.00 to 10.00
Antwerp.....	0.12	0.32½	0.35	0.20	0.35	0.70	7.00T	Fair	Oriental Ports (logs)....	10.00 to 11.00
Havre.....	0.14 to 0.15	0.50	0.35	0.27½	0.40	0.75	8.00T	Fair	Peru-Chile.....	10.00 to 14.00
Bordeaux....	0.14 to 0.15	0.50	0.35	0.27½	0.40	0.75	8.00T	Fair	South Africa.....	16.50 to 18.50
Barcelona....	0.20 to 0.25	12.00T	0.30	10.00T	—12.00T—	—	10.00T	Fair	Cuba.....	13.00 @ 15.00
Lisbon.....	0.20	0.65	0.40	7.00T	—20.00T—	—	7.00T	Fair	United Kingdom.....	80s to 90s
Marseilles...	0.14	0.55	0.50	5.60T	—20.00T—	—	5.00T	Very Slow	United Kingdom (ties)...	70s to 80s
Genoa.....	0.16½	11.50T	0.40	8.00T	—17.00T—	—	10.00T	Fair	Baltimore-Boston range.	\$13.00 to 14.00
Naples.....	0.16½	11.50T	0.40	8.00T	—17.00T—	—	10.00T	Fair	Baltimore-Boston range.	(ties)..... Not quoted
Constantinople	0.27½	17.00T	0.75	0.32½	—20.00T—	—	9.00T	Fair	Buenos Aires.....	14.00
Alexandria...	None	17.00T	0.75	0.32½	—20.00T—	—	9.00T	Good	Flour and Wheat	
Algiers.....	0.22	0.75	0.75	0.40	—20.00T—	—	7.00T	Very Slow	U. K. and Continent	
Dakar.....	.....	14.50T	.....	12.00T	—20.00T—	—	10.00T	Good	(gross ton).....	27s 6d to 30s
Capetown....	12.00T	12.00T	.....	10.00T	—12.00T—	—	9.00T	Good		
Buenos Aires.	.....	18.00 to 20.00T	.....	.....	18.00 to 20.00T†	8.00 to 8.80T	Good			
**Rio de Janeiro	.....	19.00 to 21.00T	.....	7.00 to 7.70T	19.00 to 21.00T†	7.00 to 7.70T†	Fair			
Pernambuco...	.....	22.00T	.....	9.00T	—22.00T—†	9.70T†	Fair			
Havana.....	0.22½ to 0.27½*	0.42½*	.....	0.22½*	0.54*	1.08*	0.20*	Fair		
Vera Cruz....	0.25	0.40	0.45	0.25	0.52½	1.05	0.30 to 0.35	Fair		
Valparaiso...	.....	1.07	.....	0.70	0.45	0.80	10.00T	Slow		
San Francisco.	.....	0.40 to 0.70	.....	0.50 to 1.10	.....	2.50	0.55 to 1.00	Good		
Sydney.....	.....	18.00T	2.50	18.00T	18.00-24.00T	9.00-12.00T	Fair			
Calcutta.....	.....	16.00T	0.60	12.00T	—16.00T—	10.00T	Good			

T—Ton. †Per quarter of 480 lbs. †Landed. ††Heavy products limited in length. *Extra charge for wharfage.

**Plus \$1.00 surcharge on all rates to Rio de Janeiro on account of congestion.

Principal Rates To and From United Kingdom

Grain, River Plate to United Kingdom.....	24	0	Pig iron, United Kingdom to New York	15	0
Coal, South Wales to Near East.....	10	3	or Philadelphia.....	7	0
Coal, United Kingdom to Buenos Aires.....	12	0	Iron ore, Bilbao to Glasgow.....	10	6
Manganese Ore, Poti to Philadelphia.....	\$4.00		Iron ore, Huelva to Phila. or Balto...		

Bunker Prices

At New York

	Coal alongside per ton	Fuel oil alongside per barrel	Diesel oil per gallon
Jan. 9, 1924..	\$5.25@6.50	\$1.41½	4.63@5.42c
April 8.....	4.50@6.50	1.66½	5.51c
July 21.....	4.50@6.25	1.81½	5.16@5.65c
Oct. 21.....	5.00@6.05	1.81½	4.91@5.16c
Nov. 22.....	5.00@6.05	1.81½	4.91@5.50c
Dec. 22.....	5.25@6.05	1.86½	5.15@5.50c

At Philadelphia

	Coal trim. in bunk. per ton	Fuel oil alongside per barrel	Diesel oil per gallon
Jan. 9, 1924..	\$5.50@6.30	\$1.415	3.86c
April 8.....	4.85@5.85	1.955	5.41@5.65c
July 21.....	4.85@6.00	1.945	5.40
Oct. 21.....	5.00@5.80	1.815	4.90c
Nov. 22.....	5.00@5.80	1.815@1.83	4.90@5.14c
Dec. 22.....	5.25@5.80	1.865	5.15c

Other Ports

Boston coal, per ton	\$6.81
Boston, oil, f. a. s., per barrel	\$1.55
Hampton Roads, coal, per ton f.o.b., 4.35@4.75	
Cardiff, coal, per ton	17s 0d
London, coal per ton	22s 6d
Antwerp, coal, per ton	24s 0d

Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

By Harry Bowne Skillman

Attorney at Law

A PROVISION of a through bill of lading issued by a railroad company for a shipment to a European port, that the property should be subject to all conditions expressed in the regular forms of bills of lading in use by the steamship company at the time of shipment, is valid and makes the provisions of such ocean bills of lading a part of the contract, it was decided in the case of *SUSQUEHANNA*, 291 *Federal Reporter* 698. The court also held that provisions in ocean bills of lading that the carrier shall not be liable for any claim unless written notice thereof is given before removal of the goods from the wharf, and that no suit therefor shall be maintainable unless instituted within three months after such notice, were reasonable and valid.

* * *

The term "default," as used in a charter party fixing lay days for loading and providing for demurrage for detention through "default" of the charterers, means merely failure to comply with the agreement to complete loading in the specified time, it was held in the case of *NIVOSE*, 291 *Federal Reporter* 412, and does not embrace all the excuses usually found in standard forms of charter parties in general use.

* * *

The master of a barge lying in a slip, though he knew a vessel was coming in and that his barge, with others, would be moved, was held in the case of *ACHILLES*, 291 *Federal Reporter* 636, not negligent in failing to keep continuous watch, where the moving did not involve any apparent danger.

* * *

The loss of a tow by a tug between Cape Cod canal and Boston was not the proximate result of the captain's failure to look for storm signals before leaving the canal, where the warning displayed was not such as would have led a reasonably careful navigator to remain at the canal under like circumstances, it was held in the case of *MERCURY*, 291 *Federal Reporter* 797. A tug, it was further said, is not liable as an insurer or common carrier, but is only held to that degree of care and skill which a reasonably prudent navigator would have exercised under similar conditions and circumstances.

* * *

The principle governing computation of damages caused by collision is that the sufferer by the collision which is the result of wrongdoing, whether by negligence or mistake, is entitled to restitution in integrum. It is that, as far as practicable, the owner is to be restored to the same pecuniary position as if no

collision had taken place, and where a ship is totally lost the owner is entitled to recover the actual value, and this is defined in the admiralty courts to be her market value; that is to say, the gross sum for which she might have been sold immediately before the collision. That a vessel, when sunk in collision in war time, was under requisition to the government, does not affect the fact that the monetary loss, which was that of the owner, was her then market value, and, if that value was enhanced by reason of war conditions, he is entitled to such enhanced value, since nothing less would be restitution. Where, at the time of the loss of the vessel, there was no market value, because war conditions prevented there being vessels in the market, the measure of damages for the loss is the cost of reproduction, less depreciation; enhanced prices of shipbuilding, due to war conditions, while unusual, were not artificial or fictitious, but actual, and must be considered in computing the cost of reproduction of a ship lost in collision during that time.—*CUSHING*, 292 *Federal Reporter* 560.

* * *

Presumption of unseaworthiness alone will sustain a recovery in a case where a vessel sinks or brings about a collision from an unknown cause, where nothing but her unseaworthiness can explain the accident. "The presumption of unseaworthiness arises where the only inference in the circumstances is that of unseaworthiness," where the circumstances surrounding the accident exclude all other inferable causes.—*CITY OF CAMDEN*, 292 *Federal Reporter* 93.

* * *

In the case of *PRUDENCE*, 292 *Federal Reporter* 371, it was held that a tug, with two barges in tow tandem, and the second barge were in fault for a collision between the latter and an anchored schooner, when entering Maurice river, New Jersey, at night, the tug for not navigating with reasonable care to avoid the schooner, whose lights she saw when 1½ miles away, and for not shortening her towing lines on entering the river, and the barge for not keeping a lookout.

* * *

The merchant marine act of June 5, 1920, section 33, giving a legal remedy to injured seaman, is limited in application to navigable waters of the United States, and is not unconstitutional as an attempted interference with intrastate commerce over waters of a state.—*McCullough v. Jannson*, 292 *Federal Reporter* 377.

* * *

"Assuming," said the court in the case of *OWEGO*, 292 *Federal Reporter* 403,

"that the owner of a lighter may be entitled to a lien in some cases, it does not follow that the lien exists in every case. Usually lighterage is a charge on the cargo, and the lighterman would have his lien on that. If the lighter was hired by the agent of the ship and then merely stood by, or if, after her use had terminated, through negligence she was not promptly returned, no lien would be created for the time she was actually serving the ship. Not every maritime contract creates a lien."

* * *

The ship mortgage act of June 5, 1920, section 30, is intended for the protection of the actual laborer, and does not apply to the lien of a contracting stevedore. "The reason for this," it was said in the case of *OWEGO*, 292 *Federal Reporter* 403, "is clear. A laborer could not be expected to make inquiries and to inspect the ship's papers before doing a day's work. The same reason does not apply to a contracting stevedore. He is in the same position as material men and repairmen whose liens are not preferred to a prior mortgage, and he is entitled to no greater rights."

* * *

"The stipulations in a bill of lading limiting the time within which to present claim for loss or damage and within which to bring an action, if reasonable, is binding. * * * While the negotiation for compromise of claim, it seems, does not waive the contract of limitation, nor surrender the right of a bar which had already fallen, it is settled, however, that where all of the benefits of notice are placed before the carrier as fully as should be done by a formal notice, the necessity for the formal notice is obviated. Especially is this the case where the carrier, with the aid of the shipper, has made an examination of the nature and extent of the injury, and has obtained as full information as a notice would have disclosed."—*HENRY S. GROVE*, 292 *Federal Reporter* 502.

* * *

"The mere booking stipulations," it was declared in the case of *HENRY S. GROVE*, 292 *Federal Reporter* 502, "do not preclude the issuance or acceptance of a bill of lading by the shipper as expressing the terms of the agreement between them, and when this is done both the parties are bound by its provisions."

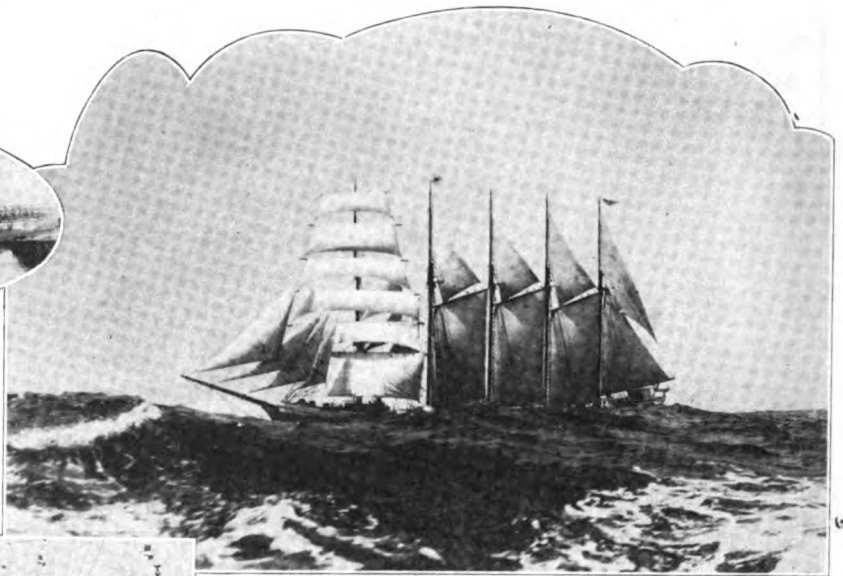
* * *

A seaman is one "who can hand, reef, and steer;" a mariner in the full sense. The seaman is not charged with any responsibility with relation to the seaworthiness of a vessel, nor is a seaman in that sense a person employed in loading and unloading the vessel.—*OWEGO*, 292 *Federal Reporter* 505.

Photographs from Far and Near



Entrance to Indiana Harbor, Lake Michigan. Unloading iron ore for Chicago district blast furnaces. Below, launches of Cousins' fleet used to carry stevedores to vessels in Humboldt bay, Cal.



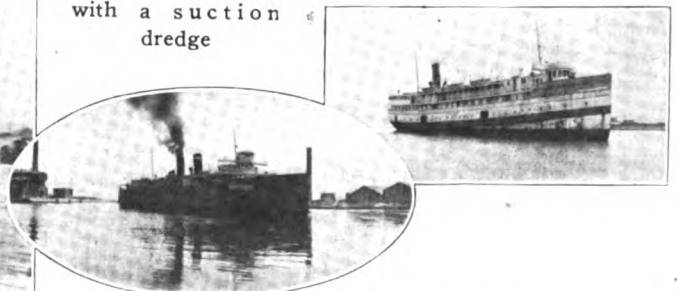
American barkentine Anna Comyn under full sail on the Pacific—at present an unusual but always beautiful marine scene



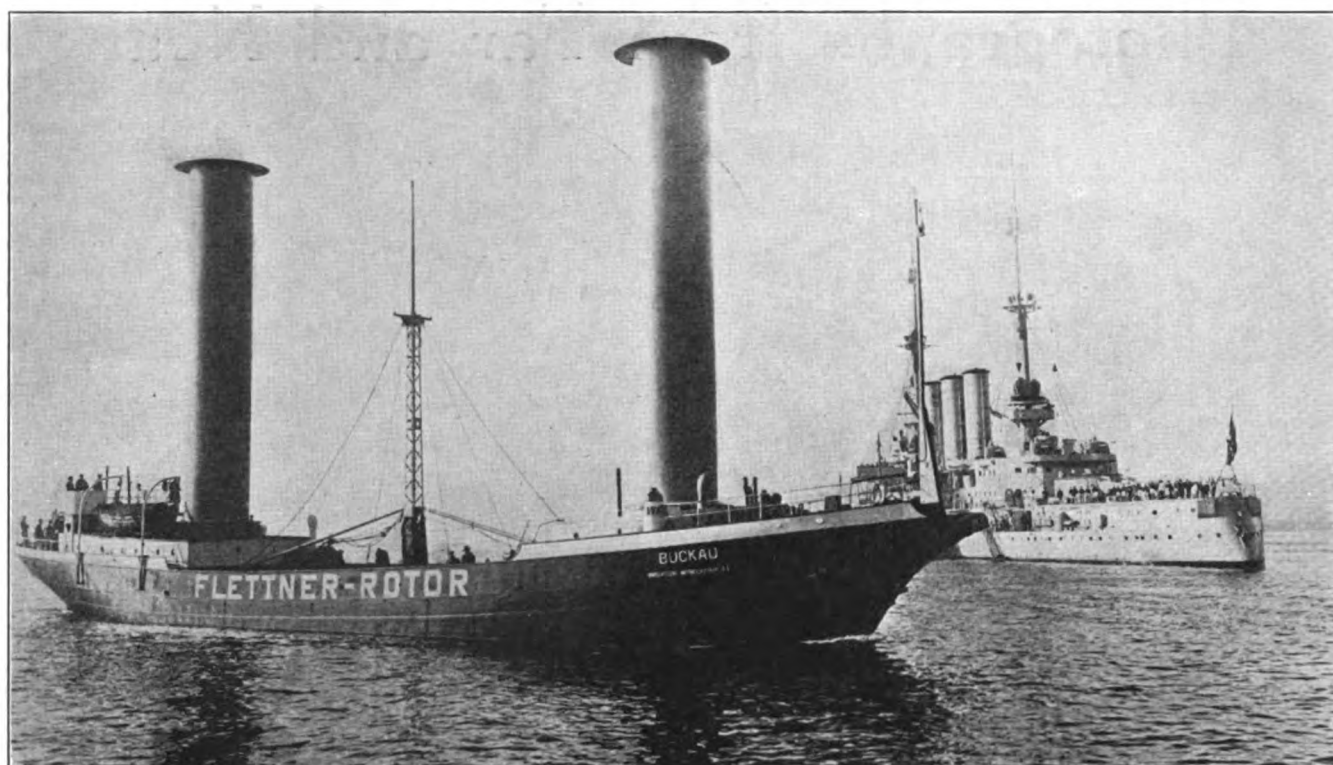
Bark Wanderer which went ashore a few hours after starting a whaling trip from New Bedford, Mass., formerly world famous as the home of hundreds of whalers. The Wanderer's sailing days are over



In 1799, the Lutine with millions in gold and silver aboard went ashore off Terschelling, Holland. The wreck has been located several times since but lost owing to the rapidly shifting sand bottom. Now modern treasure hunters seek her with a suction dredge



Lake Michigan carferry Milwaukee entering river at Milwaukee. At right, Lake Michigan passenger carrier Pilgrim



Revolving Towers Designed to Replace Sails Undergoing Their First Test

Uses Revolving Towers To Drive Ship

BY CARL COMMENTZ

REPORTED results of trials made in the first days of November with a vessel fitted with the new Flettner system of wind drive, have attracted a great deal of attention. The trials were made with the BUCKAU, a former sailing schooner of 635 tons burden with an auxiliary screw propeller diesel engine of 160 brake horsepower.

This vessel has been converted during the past few months at the Germania yard in Kiel, Germany, for the owner, the Hanseatische Motorschiffahrts Co., Hamburg, to the design of Anton Flettner, inventor of the well known Flettner rudder. The rigging was taken down and two new strong masts, able to stand considerable side pressure without stays and shrouds were fitted. Around these masts, large cylindrical towers made of sheet iron, thickness about 1/12 inch were so fitted in bearings, that they may be easily revolved by an electric motor of very small power. The diameter of these large cylinders, which have a height corresponding to that of a normal rigging, is about ten feet. The vessel naturally has an unusual aspect. The cylinders may be revolved in both directions and at a speed of up to 100 revolutions per minute.

The whole installation is, as may be

seen by this description, of a simple character and embraces no details, which are difficult in a technical sense or cause considerable costs. If the revolving towers are blown at by the wind, certain turbulent disturbances in the wind current are created and thus a pressure is exerted upon the cylinders, which is decidedly larger than that created by the wind when blowing upon the canvas of a full rigged vessel.

The trials made with the BUCKAU in the Baltic sea near Kiel are claimed to have realized the theory of the new drive fully. A number of shipping, ship-building and insurance experts were present. Even with a moderate gale, the power taken by the revolving towers out of the wind was so considerable, that the speed of the vessel was decidedly larger than before the conversion of the rig.

Can Turn Quickly

A number of details in the working of the new drive are said to be superior to sail drive. The maneuvering qualities are excellent. If the towers are stopped one after the other, and then revolved in the opposite direction, the ship turns through the wind, either by the bow or by the stern, dependent only on which of the towers is first reversed. This

change is done in a fraction of the time necessary with a sailing vessel and thus the ship's speed is not slowed down. The ship may be run in almost any direction to the wind and may cruise in much sharper angles to it than a sailer, but the best speed qualities are developed with a good beam wind.

During the trials, it is said, proof was given that the high towers do not endanger the stability of the vessel. Different from a sail rig, the pressure exerted by a squall—and some severe hail squalls were met during the trip—is not much greater than during normal wind velocity, because it is dependent not only on the wind velocity but also on the revolving velocity of the wind towers, which is naturally not increased but rather decreased during a squall. As concerns stability of the ship, it is of a certain value that the actual weight of the towers amounts to only about one-fifth of the weight of masts, booms, canvas and ropes.

The innovation had been worked out in extensive investigations made with revolving cylinders and ship models in the wind tunnel of the aerodynamic institute of the University of Gottingen. At first, Herr Flettner intended to apply his system of rudder working to the sail rigging of ships and had designed

a sailing ship with sheet metal sails, which would be operated by auxiliary blades fitted at the outer edge of these sails.

When trials with these sails were made, Herr Flettner conceived the idea of having the Magnus effect tried in the wind tunnel. This is a physical phenomenon known for about 70 years and named for its first observer. In the fifties of the last century, Professor Magnus stated that a revolving cylinder, when blown at by an air current displays the same qualities as a sail, that means, it exerts a pressure in another direction than that in which the air is blowing. But this effect had been neglected entirely until the problem was taken up by Flettner.

The trials in the wind tunnel proved that under certain favorable conditions, the pressure exerted by the revolving cylinder is enormously larger than was supposed until now and much superior to the effect of a sail. Indeed the maximum effect of a revolving cylinder of a certain area is about 15 times as large as that of the corresponding sail area. When this was found out, Flettner left the idea of sheet metal sails and de-

veloped the tower drive system. New investigations of comparative character were then made with ships' models fitted with sails and with rotor towers. In these trials, the effect of sails was for the first time investigated in a scientific manner and proved to be of medium quality only when compared with the excellent effect of the towers.

The result of these trials induced the shipowners, Donitz, Witt & Co., Hamburg, who own a number of sailing vessels with auxiliary drive, to have the BUCKAU changed for rotor drive to the designs of Herr Flettner. Some weeks ago, a new company, the Hanseatische Motorschiffahrts Co. was founded for the purpose of promoting the new drive. In this company, Messrs. Donitz, Witt & Co. have a large share and their vessels were taken over by it. It has been decided meanwhile that the other vessels of this fleet will be fitted with the new wind drive.

The question which naturally arises from the impression of the recent trials is that of the economical importance of the innovation. Its advocates believe that a new drive has been created which requires scarcely any power, for that

needed to revolve the towers is insignificant, and which requires no crew for working it. The operation of the tower may be done by a single man occasionally serving the switchboard. Moreover, this drive is said to be much superior in effect to normal sailing. These are the main points, inferior ones may prove to be of importance in actual service.

A probability exists that these qualities may lead to an extended application in the shipping trade. No doubt, this would be done in close connection with the screw drive. Whether it will be preferable to have the wind power drive act as the main drive and the screw drive only to overcome calms, or whether the wind drive will only serve to increase the speed of steamers and motor vessels, would be answered by each individual case as conditions are different for different routes and different types of vessels. Study also would be necessary to determine the economic advantages of converting sailing vessels, of fitting additional towers to such mechanically driven ships as are fit for the purpose, or of building new types of ships with new forms and ranging between steamships and sailing vessels.

How Wind Acts on Tower Type of Ship

INTEREST in the sailless ship announced by Anton Flettner, German engineer with several successful marine inventions to his credit, has rested both on the ambitious claims made for such ships and the scanty information available. Early in December, much of the mystery was dispelled when a second trial trip of the first 'rotorship' was held and German and foreign engineers attended. Herr Flettner also has delivered a paper before a German technical society within the past few weeks, explaining his device.

The following clear and complete report was prepared by the representative of the Liverpool, England, *Journal of Commerce*, who witnessed this trial trip in December. It will answer most of the questions which have arisen since this novel ship was announced.

Having attended an actual demonstration of the Flettner rotor ship BUCKAU and subsequently inspected the vessel herself, one now feels in a position to comment on this extremely interesting vessel.

In the first place it would be as well to state briefly the actual facts as to the effect of wind pressure on a rotating cylindrical tower, when such a tower is rotating about an axis perpendicular to the direction of the wind. A number of misleading statements have appeared on this point and the following notes may

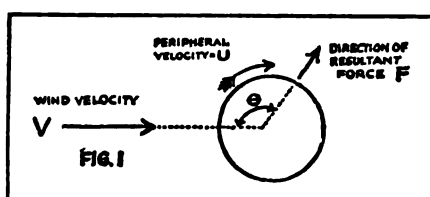


FIG. 1—PRINCIPLE WHICH LED TO DESIGN OF SAILLESS SHIP

serve to make this point quite clear.

In Fig. 1, a section is assumed taken through the cylinder at right angles to its length and we may treat the problem as one having only two dimensions.

The wind velocity is taken $=V$ and the peripheral speed of tower $=U$.

The resultant force on the tower $=F$ and this is acting in a direction making an angle of α degrees with the direction of the wind.

When $U = \alpha$, that is, when the tower is not rotating, $\alpha = 180$ degrees, and V and F are acting along the same line. F has then a value for any given wind velocity which is stated to be less than the F which would be exerted by a wind of the same velocity on the masts and rigging which have been replaced by the rotor tower. This statement should be treated with reserve, as it obviously depends entirely on the presumed efficiency of the rotor tower as compared with sails, and such efficiency as will be

seen later is not easy of assessment. It may be accepted, however, that the statement is true if the product of the height and diameter of the tower is about one-tenth the area of the sails which it replaces. This point will be referred to again later.

If now we rotate the rotor tower, the direction of the resultant force F alters, and it travels round against the directions of rotation of the tower, the angle α being reduced from 180 degrees to about 100 degrees under the most favorable conditions. The objective toward which Herr Flettner's experiments were directed was that of reducing this angle α to 90 degrees, but so far it would appear that the best results obtained resulted in α being reduced to about 100 degrees. It is stated by Herr Flettner that with careful design α may be reduced to from 100 to 120 degrees, and it is reasonable to assume that one may fairly safely take $\alpha = 110$ degrees as a basis of argument, and as a good average figure for a successful design.

In obtaining these results, experiments were made and curves plotted which showed the effect of varying the peripheral speed U while keeping the wind speed V constant, and it was discovered that when U is about 3.5 times the wind speed V , the pressure effect is greatest, that is, the resultant force F reaches a maximum value. This maximum value is

stated to be over ten times the value of the force which would be exerted by the same wind on a sail of area equal to the projected area of the tower, that is, equal to an area represented by the height of the tower multiplied by its diameter, this sail being placed squarely in the path of the wind.

Apparently the conditions giving the greatest value of F also give practically the lowest value of α , the result being that when the wind is 20 degrees, or

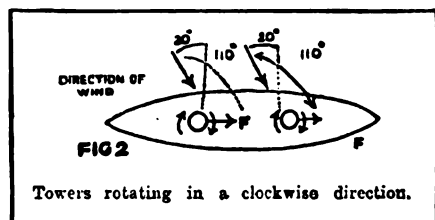


FIG. 2—TOWER SHIP SAILS BEST WITH WIND TWO POINTS ABAFT THE BEAM

about two points, abaft the beam, and the towers are rotating with a peripheral speed equal to about 3.5 times the wind speed, the resultant propulsive effect is a maximum. The resultant pressure from the towers acts along the middle line of the vessel and there is no tendency to drift and no need to use helm. This is illustrated in Fig. 2.

Effect of Squalls

The question now arises as to the effect on a tower of changes in wind speed, such as result from sudden squalls and so on. In the first place, we may assume the tower to be still. Experiments carried out in these circumstances by Herr Flettner, and also experiments made previously, indicate that the force on the tower due to a steady wind pressure is less than the force on the mast and rigging which would be necessary to carry a sail area ten times the projected area of the tower. While the actual projected area of the mast, yards, rigging, etc., may be less than the projected area of the tower, when light flexible members are subjected to wind pressure they vibrate, and their effective area of resistance increases considerably.

The steady, smooth cylindrical shape of the tower, on the other hand, facilitates the passage of the air currents to some extent, and it is found that the total pressure on the tower is less than that on the masts and rigging. Experiments were made by Herr Flettner on a tower having a fluted surface, but it was found that while the propulsive effect was good, the resistance of the tower to direct wind pressures, when it was not rotating, was increased, and this idea was, therefore, dropped.

When the smooth tower is rotating, the

experiments carried out showed that no increase in wind pressure, in the direction of the wind currents, resulted from an increase in the wind speed beyond about 40 feet a second. This is a matter of some importance, as it means that sudden gusts of wind or sudden increases of wind speed, arising from a beam wind, would not create a capsizing effect greater than that due to a wind of about 40 feet a second, obviously a valuable safeguard when predetermining the measure of stability necessary for a new vessel.

Using Higher Wind Speed

Considering now the effect of increase in wind speed on the resultant force on the tower (we have so far only considered the component of this force acting on the tower in the direction of the wind), we are faced with further interesting experimental facts. It has already been remarked that the maximum resultant force on the tower is experienced when the value of U is about 3.5 times the value of V . If now we have our tower rotating with a peripheral speed of, say, 70 feet a second, we shall be obtaining the best propulsive effect from a wind two points abaft the beam, and of a velocity of about 20 feet a second. An increase in wind speed to 35 feet a second, that is, a change from a moderate breeze to a fairly fresh breeze, would reduce the ratio of U to V from 3.5 to only 2. The resultant force

rotating tower of nearly 50 per cent, the net alteration of propulsive effect due to the sudden change being hardly noticeable. To obtain the full effect of the increased wind speed the peripheral speed of the towers would need to be increased to about 120 feet a second.

Preventing Loss of Efficiency

So far we have considered the problem as one of only two dimensions, and it is necessary to appreciate the fact that unless steps are taken in the practical design to maintain the correctness of this assumption, the results obtained will be unsatisfactory. Without going into the question of the actual scientific reasons for the effects created by the rotating tower, we know that there is a region of relatively low pressure on the side of the tower on which the direction of the wind and the direction of rotation of the tower are the same, and a region of relatively high pressure on the side of the tower on which these two motions are in opposition to one another. Briefly, loss of efficiency will occur if the external air at the ends of the rotating tower is allowed access to this region of low pressure, or if air from the high pressure region is allowed to leak out into the external air existing at the ends of the tower. To prevent either of these losses occurring, end plates are fitted to the tower, these having an overall diameter about 50 per cent greater than the diameter of the tower. With

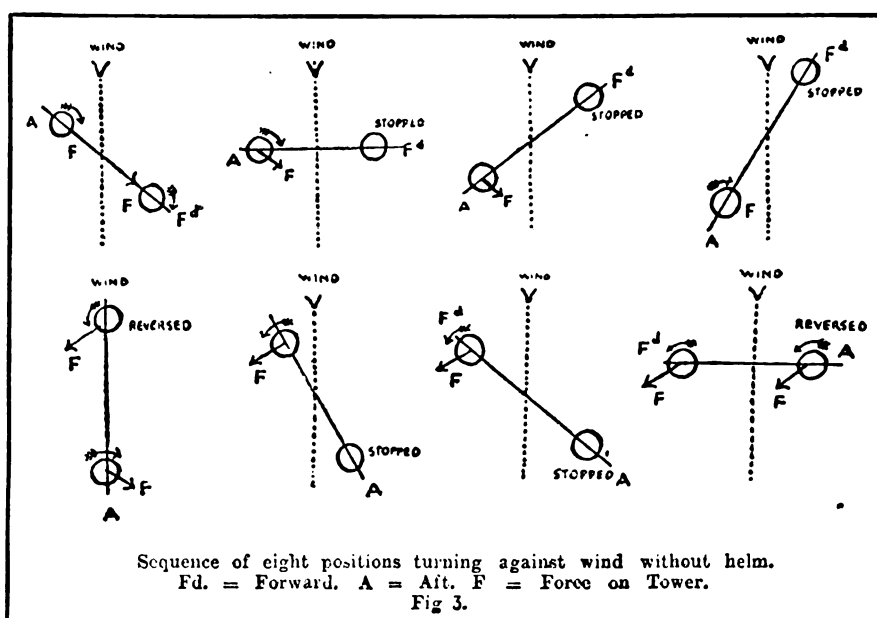


FIG. 3—TURNING TOWER SHIP AGAINST WIND WITHOUT HELM

would only be slightly altered for while the effective pressure of a wind of 35 feet a second is nearly double that of a wind of 20 feet a second, when it acts on a flat sail, with a rotating tower the drop in the ratio U to V , from 3.5 to 2 involves a loss of efficiency of the

these in position, it appears reasonable to assume that fairly accurate estimates can be obtained by considering the wind effects on towers as 2-dimensional.

In applying the results of the experimental work to the case of the BUCKAU, two towers were erected, each about 48

feet high originally and about 8 feet, 8 inches in diameter. The projected area of these two towers was reckoned to be equal to one-tenth the area of sail the vessel had previously been arranged to carry. The height of the towers was increased to 57 feet after a few trials, the result being that as the vessel now exists, the projected area of the towers is between one-eighth and one-ninth of the original sail area.

The towers are situated, roughly, two-

supplied with current from a dynamo driven by a 45-horsepower diesel engine. The lower ends of the pivot towers are arranged to carry water ballast, presumably in case of necessity, but it would not appear that need had arisen for either of these spaces to be so utilized.

The material forming the rotating sleeves is only about 1-25 of an inch thick for the main part, it being understood that this thickness is increased to about 1-16 of an inch at the deck level. Each

ful whether the net saving of weight when all factors are considered will be at all approaching the 28 tons claimed. There is undoubtedly an increase in initial stability.

The control of the towers appears to be a simple matter. Two dials are placed on the control bridge, which dials indicate the speed and direction of rotation of the two towers. They, in effect, correspond to the revolution indicators or telegraphs in a twin-screw ship. The helmsman in the BUCKAU is positioned close behind the control bridge, which is abaft the after rotor tower, and he receives his orders directly from the master. While the means of control are simple, however, the actual determination of the steps to be taken in executing a maneuver does not appear to be quite so obvious, and the diagrams in Fig. 3 indicating successive positions of the ship and also the movements of the towers while turning into and through the wind, without the use of helm, will make this point clear.

It will be noted that some care is necessary to correctly time the operations of stopping and reversing the towers, if the maximum advantage is to be taken of the turning effect which may be developed by their aid. Particular claim is advanced by Herr Flettner for the rotorship on the score of ease of maneuvering when making progress against an adverse wind, and it is quite clear that with practice a master would save a good deal of time when changing course, as compared with the time taken by a sailing ship, with masts and yards, to go through the same maneuver.

Turning With Wind

The sequence of operations when turning with the wind is shown in Fig. 4.

Both of these diagrams have been prepared to illustrate the use of the rotors for turning the vessel without rudder effect. In a breeze, of course, it is possible to make the turn more easily by using the rudder as well, but in light airs the effect of the rudder is very small owing to the small amount of headway on the vessel, and the rotor towers are then of considerable value if one has no other auxiliary engine.

During the demonstration on Dec. 3 the wind was very light, and the speed of the BUCKAU did not appear to exceed about 3 knots at any time. A large crowd of German, Dutch, French, Japanese, British and American marine men were present. Interest taken in England in the new ship is shown by the fact that representatives were present from the P. & O.; British India; Alfred Holt; Furness, Withy; Armstrong; Swan, Hunter; Hawthorn, Leslie; Vickers; Barclay, Curle; and Palmers shipping and ship-building companies.

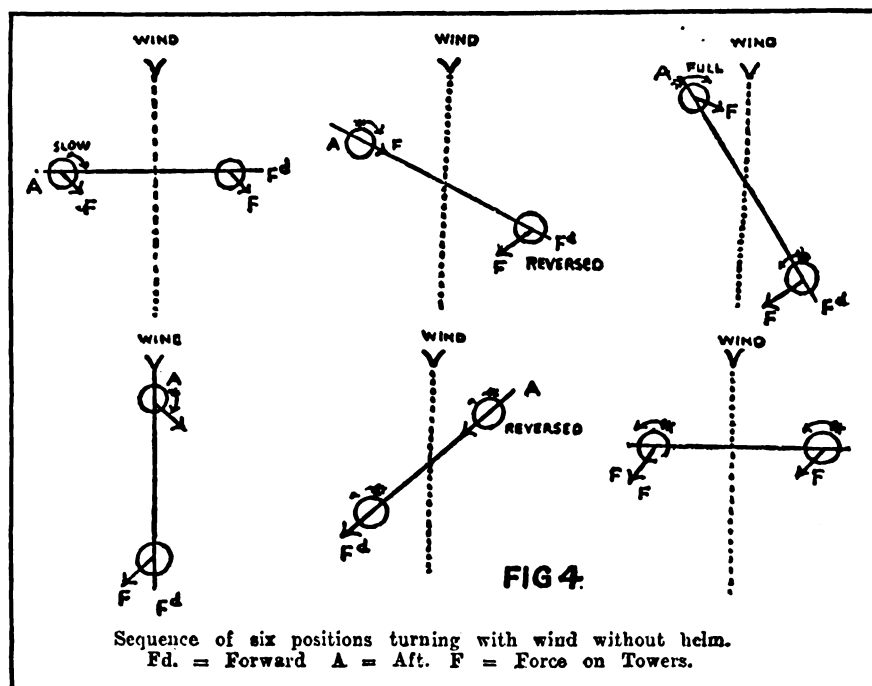


FIG. 4—TURNING TOWER SHIP WITH WIND WITHOUT HELM

thirds the length of the vessel apart, the forward tower being somewhat nearer the end of the water-line than is the case with the after tower. These two towers are each rotated by an electric motor, and a tribute should be paid to those responsible for the design and building of this experimental installation. The pivot towers on which the rotating sleeves are supported are built up of plate and sectional material, and are themselves over 52 feet high from the keel of the vessel, to which they are rigidly secured. At the top of each of these pivot towers are ball or roller bearings, through which the weight of the rotating sleeve, and also the transverse pressure on the rotating sleeve are transferred to the structure of the pivot towers.

How Towers Are Driven

The driving effect is transmitted to the sleeves through a 6 to 1 gear just below the top of each of the pivot towers. The motors are housed one at the foot of each tower, and are reversible direct current shunt wound motors of 11 kilowatts, 220 volts, having a speed of 750 revolutions per minute. These motors are

sleeve is stiffened along its length and at intervals around its circumference by internal angles of light scantling. Taking into consideration the constructional difficulties of making so light and so uniform a cylinder, and also of mounting it in the ship, the care given the installation will be appreciated when it is remarked that even when rotating at 120 revolutions per minute, there is an almost entire absence of noise of any description, while, were it not for the fact that a helix has been painted on each cylinder, it would be impossible to tell whether or not the cylinders were rotating even at a distance of nine or ten yards.

According to Herr Flettner, the total weight of the pivot towers complete with the cylinders is 7 tons, and it is stated that the old rigging which was removed, and which presumably included the masts, spars, rigging, and sails, was 35 tons. This appears a great saving, but sight must not be lost of the fact that it has been necessary to install a 45-horsepower diesel engine and dynamo, with the foundations, etc., to carry them, and that further it is essential that fuel should be carried for this engine. It is doubt-

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	392	1,709,329	456	1,921,088
October	459	1,915,122	540	2,332,411
September	476	2,072,324	483	2,026,172
August	406	1,650,694	479	2,018,621
July	491	1,937,802	525	2,081,663
June	465	1,882,471	495	2,014,598
May	466	1,811,769	520	2,046,833
April	469	1,814,848	504	1,958,579
March	418	1,517,503	459	1,694,905
February	378	1,467,340	445	1,738,675
January	370	1,513,056	434	1,749,172
December, 1923.	383	1,507,914	445	1,658,423
November	418	1,768,503	461	1,976,338

Philadelphia				
(Including Chester, Wilmington and the whole Philadelphia port district)				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	85	220,852	59	174,470
October	75	171,465	52	137,653
September	82	192,900	66	161,925
August	86	192,777	57	138,280
July	90	195,704	63	149,736
June	94	214,439	75	179,939
May	99	219,934	76	216,237
April	82	195,774	82	232,501
March	80	203,260	66	190,240
February	86	224,309	64	186,373
January	60	151,915	53	155,550
December, 1923.	78	227,055	64	190,644
November	78	198,122	54	135,077

Boston				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	97	310,423	55	149,777
October	128	327,931	82	179,963
September	113	308,352	75	183,286
August	120	293,661	91	176,563
July	139	351,477	99	193,747
June	147	283,982	110	200,026
May	122	260,300	100	219,216
April	100	282,324	63	165,557
March	89	262,438	50	132,863
February	99	307,627	44	139,504
January	84	250,335	47	116,832
December, 1923.	102	285,125	48	130,115
November	91	305,230	60	166,404

Portland, Me.				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	15	26,281	12	19,616
October	11	12,506	15	24,551
September	19	42,910	16	34,813
August	24	52,400	25	54,739
July	18	43,926	22	49,365
June	20	34,631	19	31,911
May	19	33,970	21	40,832
April	17	75,406	21	91,045
March	23	79,648	22	72,517
February	20	67,476	22	69,594
January	22	56,749	23	59,235
December, 1923.	29	104,724	26	100,583
November	25	80,910	24	74,849

Providence				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	11	45,232	8	37,967
October	6	16,071	8	14,522
September	7	20,038	5	21,937
August	7	21,863	5	18,916
July	8	27,747	7	28,730
June	5	21,873	4	10,456
May	10	23,795	4	17,931
April	9	30,592	6	18,959
March	7	33,895	6	23,517
February	10	39,388	8	35,236
January	8	33,215	7	28,927
December, 1923.	12	43,345	7	23,294
November	5	23,038	6	15,700

Baltimore				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	105	325,934	97	305,601
October	101	297,822	118	355,500
September	94	282,861	100	289,324
August	90	278,346	105	329,470
July	106	318,585	106	318,182
June	117	339,212	104	298,765
May	122	369,797	126	378,501
April	112	329,900	106	510,159
March	98	297,869	110	331,665
February	99	310,158	107	335,108
January	83	270,169	99	315,804
December, 1923.	117	365,142	110	354,229
November	90	280,617	91	279,278

Norfolk and Newport News				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
October, 1924.	39	95,375	71	227,247
September	30	83,640	80	251,466
August	27	80,338	94	281,959
July	30	78,138	102	301,920
June	36	105,301	83	235,667
May	27	73,846	94	269,752
April	27	82,382	83	234,550
March	19	55,501	81	243,065
February	38	105,233	90	259,085
January	31	96,074	79	249,575
December, 1923.	30	86,444	75	219,325
November	24	65,263	83	239,807
October	18	56,473	65	188,805

Savannah				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	36	109,623	39	115,168
October	35	101,689	31	93,380
September	34	94,422	36	100,903
August	25	71,138	25	68,527
July	23	56,548	25	64,981
June	29	77,096	25	66,483
May	36	94,106	35	92,503
April	23	63,518	25	67,087
March	31	82,928	34	90,122
February	28	64,961	30	89,599
January	28	88,627	32	96,979
December, 1923.	26	72,541	21	64,973
November	24	75,739	23	67,551

Key West				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	90	101,387	84	102,408
October	75	92,284	72	89,364
September	84	103,588	83	98,063
August	81	93,805	82	94,082
July	94	110,228	91	106,127
June	54	65,770	58	71,102
May	98	110,675	95	104,661
April	92	95,435	85	90,677
March	103	112,577	89	97,276
February	83	83,119	78	84,678
January	69	79,224	70	82,775
December, 1923.	71	88,377	71	91,121
November	80	97,642	85	97,599

Mobile				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	80	169,400	73	156,327
October	73	181,091	74	156,759
September	80	176,416	71	160,717
August	75	145,597	73	147,681
July	77	161,386	81	166,218
June	90	196,589	73	164,783
May	74	146,668	80	157,655
April	80	151,689	70	133,920
March	83	178,637	84	182,491
February	79	168,182	86	174,517
January	81	158,416	83	159,081
December, 1923.	83	165,163	75	156,579
November	74	148,297	78	145,886

New Orleans				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	247	713,667	250	735,984
October	267	757,738	279	768,630
September	248	677,631	237	640,301
August	247	645,151	252	676,881
July	241	650,671	250	687,005
June	240	622,326	223	588,554
May	260	703,950	264	696,397
April	249	646,315	262	653,740
March	225	542,040	222	538,642
February	217	604,411	227	610,455
January	217	595,087	220	588,703
December, 1923.	239	632,193	231	634,300
November	216	575,102	218	605,923

Houston				
(Cargo tonnage)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
October, 1924.	..	34,945	...	192,986
September	94	50,710	90	171,229
August	82	66,665	84	114,966
July	59	77,062	57	288,417
June	65	74,794	72	336,312
May	72	64,937	71	362,350
April	78	76,466	73	337,757
March	88	113,064	87	411,715
February	62	82,601	65	228,178
January	60	55,037	58	267,066
December, 1923.	74	73,876	70	304,359
November	84	83,490	82	350,703
October	75	24,076	70	268,416

Galveston				
(Exclusive of Domestic)				
Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
September, 1924.	65	189,293	112	350,173
August	61	177,941	87	268,774
July	52	147,279	58	172,847
June	41	133,079	55	170,181
May	58	148,758	69	200,846
April	54	154,343	67	196,610
March	57	176,379	88	287,398
February	55	152,950	80	236,761
January	70	210,110	96	317,105
December, 1923.	71	219,767	106	313,231
November	61	172,824	95	301,148
October	83	209,343	108	334,544
September	64	164,854	100	290,715

Los Angeles				
(Exclusive of Domestic)				
Month	—Entrances—		—Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	195	310,425	121	223,778
October	156	290,697	184	285,871
September	128	333,989	136	277,479
August	96	301,744	76	239,441
July	96	337,767	74	275,993
June	102	307,659	67	258,827
May	91	290,863	75	246,104
April	100	281,343	72	251,237
March	117	272,831	95	232,805
February	135	315,365	102	237,379
January	107	246,203	124	241,859
December, 1923.	165	285,919	103	261,322
November	243	234,357	188	220,733

Marine Business Statistics Condensed

Port Traffic Record

Portland, Oreg.

(Exclusive of Domestic)

Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	27	105,529	36	137,696
October	24	92,077	43	159,017
September	26	97,923	36	128,205
August	22	78,722	31	118,526
July	11	45,451	22	84,195
June	20	72,801	29	104,309
May	16	58,889	21	72,663
April	26	90,286	33	115,504
March	27	103,891	32	118,406
February	23	85,301	35	130,528
January	12	47,848	25	97,674
December, 1923.	30	99,748	34	120,487
November	30	113,362	34	120,487

Seattle

(Exclusive of Domestic)

Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	49	203,891	45	194,766
October	45	175,725	48	198,037
September	48	193,049	41	168,594
August	35	149,904	41	179,108
July	35	156,626	47	197,330
June	50	211,828	45	175,319
May	46	188,853	43	177,581
April	46	196,591	53	220,763
March	57	236,620	45	191,152
February	48	189,146	54	213,851
January	57	233,002	60	242,577
December, 1923.	48	206,466	52	224,112
November	48	199,115	46	191,022

Port Arthur

(Exclusive of Domestic)

Month	Entrances—		Clearances—	
	No. ships	Net tonnage	No. ships	Net tonnage
November, 1924.	32	107,737	32	90,726
October	47	144,763	54	159,034
September	42	120,636	38	105,700
August	42	116,626	32	89,698
July	47	130,595	47	115,750
June	54	146,819	43	131,654
May	50	143,452	40	105,296
April	46	105,294	49	121,408
March	48	134,343	49	140,682
February	46	130,269	45	116,511
January	40	132,585	43	139,346
December, 1923.	40	124,574	44	144,733
November	36	103,124	34	106,416
October	42	141,138	37	98,531
September	31	88,975	42	118,898
August	45	122,018	56	156,908

Elect Officers To Head Goodrich Merger

New officers are announced for the Goodrich Transit Co., which is a combination of the Goodrich and Graham & Morton fleets, on Lake Michigan, in a \$5,000,000 merger recently effected. William Alden Smith, Grand Rapids, Mich., as chairman of the board, heads the executive department. Other members of this department are: W. Thorp, Chicago, president; E. Gunnell, Manitowoc, Mich., first vice president; J. S. Morton, Benton Harbor, Mich., second vice president; W. J. Thorp, Chicago, secretary and treasurer. The directors include Mr. Smith, as chairman; Mr. Gunnell, the two Messrs. Thorp, Mr. Morton, L. E. Gerr, Chicago, and N. Robbins, Grand Haven.

Record of Traffic Through Panama Canal

		Atlantic to Pacific traffic Panama Canal			Pacific to Atlantic traffic Panama Canal			Total traffic through canal Panama Canal		
		No. of ships	Net tonnage	Tons of cargo	No. of ships	Net tonnage	Tons of cargo	No. of ships	Net tonnage	Tons of cargo
1924										
October	American	91	499,269	243,004	100	517,428	813,773	191	1,016,697	1,056,777
	Foreign	107	478,460	355,401	95	428,793	605,802	202	907,253	961,203
	Totals	198	977,729	598,405	195	946,221	1,419,575	393	1,923,950	2,017,980
September	American	101	538,461	217,845	104	577,306	969,667	205	1,115,767	1,187,512
	Foreign	92	451,676	346,610	98	408,770	578,142	190	860,446	924,752
	Totals	193	990,137	564,455	202	986,076	1,547,809	395	1,976,213	2,112,264
August	American	102	575,780	241,567	94	504,003	829,934	196	1,079,783	1,071,507
	Foreign	89	408,637	290,136	87	413,475	596,842	176	822,112	886,978
	Total	191	984,417	531,703	181	917,478	1,426,776	372	1,901,985	1,958,479
July	American	114	603,339	297,625	114	588,560	897,949	228	1,191,899	1,195,574
	Foreign	104	460,039	355,339	90	384,159	546,241	194	844,198	901,580
	Totals	218	1,063,378	652,964	204	972,719	1,444,190	422	2,036,097	2,097,154
June	American	103	546,903	250,651	104	559,615	908,343	207	1,106,518	1,158,994
	Foreign	90	434,266	346,111	80	387,255	517,745	170	821,521	863,856
	Totals	193	981,169	596,762	184	946,870	1,426,088	377	1,928,039	2,022,850
May	American	108	580,686	318,891	112	586,971	1,015,608	220	1,167,657	1,334,499
	Foreign	101	470,938	393,453	96	447,075	626,034	197	918,013	1,019,487
	Totals	209	1,051,624	712,344	208	1,034,046	1,641,642	417	2,085,670	2,353,986
April	American	116	644,601	313,744	116	609,241	982,701	232	1,253,842	1,296,445
	Foreign	86	391,997	321,285	85	407,332	540,991	171	799,329	862,276
	Totals	202	1,036,598	635,029	201	1,016,573	1,523,692	403	2,053,171	2,158,721
March	American	118	622,730	328,370	117	628,038	1,044,524	235	1,250,768	1,372,894
	Foreign	94	432,942	295,178	100	452,369	604,400	194	885,311	899,578
	Totals	212	1,055,672	623,548	217	1,080,407	1,648,924	429	2,136,079	2,272,472
February	American	105	564,637	314,419	115	633,608	1,036,697	220	1,198,245	1,351,116
	Foreign	114	535,277	365,396	84	375,357	527,104	198	910,634	892,500
	Totals	219	1,099,914	679,815	199	1,008,965	1,563,801	418	2,108,879	2,243,616
January	American	132	718,017	335,654	120	645,770	1,066,254	252	1,363,787	1,401,908
	Foreign	121	555,220	346,658	103	481,033	678,766	224	1,036,253	1,025,424
	Totals	253	1,273,237	682,312	223	1,126,803	1,745,020	476	2,400,040	2,427,332

1923

December	American	143	760,701	316,251	127	708,126	1,115,399	270	1,468,827	1,431,650
	Foreign	135	607,041	418,027	101	440,623	644,957	236	1,047,664	1,062,984
	Totals	278	1,367,742	734,278	228	1,148,749	1,760,356	506	2,516,491	2,494,634
November	American	116	627,115	323,129	128	680,833	1,108,292	244	1,307,948	1,431,421
	Foreign	115	537,180	309,785	77	348,737	477,089	192	885,917	786,874
	Totals	231	1,164,295	632,914	205	1,029,570	1,585,381	436	2,193,865	2,218,295
October	American	132	727,005	286,947	129	687,521	1,141,192	261	1,414,526	1,428,139
	Foreign	97	451,734	335,800	69	273,215	363,628	166	724,949	699,428
	Totals	229	1,178,739	622,747	198	960,736	1,504,820	427	2,139,475	2,127,567

Vessels in Ballast

October	American	37	231,183	0	2	4,905	0	39	236,088	0
	Foreign	23	79,902	0	6	10,009	0	29	89,911	0
	Totals	60	311,085	0	8	14,914	0	68	325,999	0
September	American	47	271,374	0	1	4,107	0	48	275,481	0
	Foreign	17	94,556	0	3	8,954	0	20	103,510	0
	Totals	64	365,930	0	4	13,061	0	68	378,991	0
August	American	47	295,753	0	0	0	0	47	295,753	0
	Foreign	17	75,811	0	0	0	0	17	75,811	0
	Totals	64	371,564	0	0	0	0	64	371,564	0
July	American	51	297,489	0	5	6,747	0	56	304,236	0
	Foreign	21	99,346	0	5	5,084	0	26	104,430	0
	Totals	72	396,835	0	10	11,831	0	82	408,666	0
June	American	48	179,161	0	0	0	0	48	179,161	0
	Foreign	15	81,465	0	2	5,072	0	17	85,537	0
	Totals	63	260,626	0	2	5,072	0	65	264,703	0
May	American	48	277,628	0	1	209	0	49	277,837	0
	Foreign	13	71,134	0	3	4,635	0	16	75,769	0
	Totals	61	348,762	0	4	4,844	0	65	353,516	0
April	American	57	340,185	0	2	5,473	0	59	345,658	0
	Foreign	16	65,372	0	4	9,735	0	20	75,107	0
	Totals	73	405,557	0	6	15,208	0	79	420,765	0
March	American	59	341,151	0	0	0	0	59	341,151	0
	Foreign	22	109,162	0	3	9,295	0	25	118,457	0
	Totals	81	450,313	0	3	9,295	0	84	450,608	0
February	American	47	281,805	0	0	0	0	47	281,805	0
	Foreign	37	138,050	0	4	19,117	0	41	157,167	0
	Totals	84	419,855	0	4	19,117	0	88	438,972	0
January	American	66	396,712	0	0	0	0	66	396,712	0
	Foreign	45	191,380	0	2	9,269	0	47	200,649	0
	Totals	111	588,092	0	2	9,269	0	113	597,361	0
1923										
December	American	75	438,590	0	0	0	0	75	438,590	0
	Foreign	48	192,416	0	3	9,580	0	51	201,996	0
	Totals	123	631,006	0	3	9,580	0	126	640,586	0
November	American	52	307,299	0	2	8,323	0	54	315,622	0
	Foreign	39	162,303	0	2	9,554	0	41	171,857	0
	Totals	91	469,602	0	4	17,877	0	95	487,479	0

From the Old Log Book

Stray Items About the Great Lakes, Atlantic, Pacific and Gulf Coasts and Inland Rivers from MARINE REVIEW Files of 10, 20, 30 and 40 Years Ago

January, 1885

NAVY department reports that the "electric plant" for incandescent lighting which was supplied to the U. S. S. TRENTON, has given great satisfaction notwithstanding some defects in the insulation of the wires, and has added materially to the comfort and health of the officers and crew. The ATLANTA, BOSTON and OMAHA are to be lighted by electricity, with plants supplied respectively by the U. S. company of New York, the Brush company of Cleveland, and the Consolidated company of New York, respectively so that the merits of each system could be determined.

* * *

MARINE REVIEW, then known as THE MARINE RECORD, entered its seventh year with a group of "best wishes" from a number of its friends.

* * *

Amateurs in Great Lakes geography were apparently as numerous then as now. An English marine paper was quoted as having scolded Canada for wasting money on the Welland canal between Lakes Erie and Ontario when the Niagara river offered a natural connecting waterway.

* * *

Officers were elected at the fourth annual meeting of the Cleveland Vessel Owner's association. They were Capt. Alva Bradley, president; H. M. Hanna, vice president; B. L. Pennington, secretary; Philip Minch, George P. McKay, Thomas Wilson, R. K. Winslow, M. A. Bradley, J. W. Moore, H. P. Lillibridge, John H. Palmer and W. D. Rees, members of the executive committee.

January, 1895

PICKANDS, MATHER & CO., Cleveland, were named operating agents for the American Steel Barge Co., to manage its entire fleet of 27 whalebacks. This made Pickands, Mather & Co. the largest vessel operator in the country, giving them a total of 40 vessels, all of them, with one exception, of more than 2000 tons. In the comment on the deal, a remark of John D. Rockefeller that shipbuilding and shipping should be separately conducted businesses was recalled.

The Cleveland company was rated as a highly successful operator, one of its vessels having made 29 trips to Lake Superior in the past season, against a good record of 10 trips annually a few years earlier.

* * *

Pictures and descriptions were given of interesting old Pennsylvania railroad canal boats of the '40s. Freight traffic then was handled between Philadelphia and Pittsburgh by the Portage railroad joining canals on either side of the mountains. Sectional freight boats were used, which at the end of the canal were separated into three parts, loaded on cars and hauled up the inclines by fixed engines and on the level ground by locomotives.

* * *

William Livingstone Jr., Detroit, was elected president of the Lake Carriers' association, a position he now holds.

* * *

The Bethlehem Iron Co., in competition with manufacturers of 15 other nations, won through Lieut. Meigs, a contract for armor plate for Russia. This success emphasized the fact that an American battleship now was an American-built vessel throughout.

* * *

Professor Wright of Oberlin college warned lake shipowners that they should oppose the proposed Chicago drainage canal as it would seriously affect lake levels. (The actual results after years of existence has just been argued before the Supreme Court.) He compared the lakes to an elevated saucer, so that the slightest disturbance in any direction tended to send the water over the edge. A 50-foot westward tilt would send all the water through the Chicago divide. A 100-foot northward tilt would send all the water through Lake Nipissing into the Ottawa river.

January, 1905

TWO years earlier, in 1903, the steamer REPUBLIC, a lake freighter, had been lengthened 72 feet by the American Ship Building Co. This was the first lake freighter to get increased capacity by the simple expedient of increasing her length. The success of the REPUBLIC and the growing appreciation of the 10,000-ton freighter brought about

a rush of work in the winter of 1904-05 in lengthening steamers, notably the G. J. GRAMMAR, S. S. CURRY, CITY OF BANGOR, L. C. WALDO, SAVONA, CONSTITUTION and VICTORY.

* * *

Merchant Marine League of the United States presents an analysis of the new shipping bill just presented to congress. It called for a naval militia plan by which the government would pay a retainer to the seamen and officers of the merchant marine, and for higher payments for carrying mail.

* * *

American marine history repeats itself. Twenty years ago, that is in 1905, MARINE REVIEW was relating how the coastwise laws had been extended to include the Philippine islands. The time set was July 1, 1904 but congress later postponed the date until July 1, 1906. Later it was withdrawn entirely. The merchant marine act of 1920 put the Philippines under our coastwise laws beginning Feb. 1, 1922 but allowed the President to defer enforcement. The law is still suspended with no prospect of its being made effective.

* * *

L. C. Hanna retired as active head of M. A. Hanna & Co. He had been associated with this large ore and vessel company for 30 years and for 10 years had been the active head.

January, 1915

IN THIS issue, MARINE REVIEW had an interesting article on "Our Merchant Marine" written by Senator-elect Warren G. Harding. He started his article with "I speak for a restored and maintained American merchant marine." Mr. Harding certainly carried out with fidelity his own words as later when he became President, the merchant marine was one of his main interests. But even his fervor was not able to break through the heedlessness of an uninterested congress.

* * *

Rear Admiral Alfred Thayer Mahan died. He was America's foremost naval strategist and the world's greatest authority on sea power. He published his book "The Influence of Sea Power Upon History" in 1890 and immediately this gave him an international reputation.

Editorial

New Year Offers Some Big Jobs

NEW YEAR'S resolutions may last from 1 to 365 days depending upon the type of individual who makes them. But in business where the turn of the year usually means inventory not only of stocks but of progress, appraisal not only of capital value but of accomplishment, the resolutions mean more than in the case of an individual who "swears off" or "swears on" as the case may be.

To the marine field, with poignant memories of a none-too-good year and influenced by repeated declarations that the past year or two have been the worst in the history of the industry, 1925 now offers a chance for appraising what has been done and what remains to be done to put shipping and shipbuilding companies back on a profit-winning basis.

From a business standpoint, the outlook is better than it has been for several years. The progress, in European rehabilitation both economic and political, the reduction in shipping tonnage through a larger program of scrapping old ships during 1924, the smallness of new construction which now acts to reduce the available tonnage, and the general upward trend of business, all act to offer encouragement to the shipowner who has weathered the storm and to the shipbuilder who found naval construction stopped at a time when private owners were unable or unwilling to order new ships.

But as usual, especially in this country, marine conditions are affected not only by business but by political influences. On that side of the balance sheet, some progress has been made but the battle is little more than begun.

MARINE REVIEW has some definite ideas for progress along political channels which it believes would operate to the best advantage of the marine industry.

Oust Shipping Board

To demand constantly that the shipping board either sink or sell its ships and get out of the shipping business.

At first, rated as a too radical proposal, this policy has won more supporters. The better-informed statesmen, including President Coolidge, agree that government competition is a blight to an industry and that consequently our shipping cannot exist half private and half federally owned. Why should any one admit the premise but balk at the logical solution.

The shipping board is operating at a huge loss, is interfering with privately owned ships on some routes, is damaging tug owners at New York with its own fleet of tugs, is holding its good ships at prices well above instead of well below the world market and by its very existence is introducing an element of uncertainty which prevents any private owner from planning for strengthen-

ing his own fleet. Sentimentally, the withdrawal of the shipping board would result temporarily in taking some American ships out of trades in which they are now kept solely by the size and power of the country's treasury. That method surely is no measure of progress or even of encouragement for the future.

Remove the shipping board entirely as a business competitor and let it concentrate on the study and advocacy of means of putting private shipping on a legislative basis of equality with the ships of other nations. That would be a mark of progress and a guarantee of ultimate success for this country in the shipping trade. Marine executives will do well to devote 1925 to the problem of getting the shipping board out of the shipping business.

More Legislative Sense

To fight for private ownership and operation of American ships on the high seas, with modifications of the navigation, measurement and seamen's acts which will put American shipowners more nearly on a parity with foreign operators.

This proposal runs parallel with the first. The shipping board by surrendering its attempts to be a successful commercial enterprise and by devoting its time and study to the above legislative problems could really help American shipping.

Spend More Wisely

To insist on the river and harbor appropriations being taken out of politics and that the money available for this purpose be spent according to the requirements of commerce and navigation. To demand in this connection the proper improvements of the Ohio, Mississippi and other major rivers and harbors to the exclusion of obscure creeks and bays.

The frank pork barrel method of appropriation for rivers and waterways is in many minds a thing of the past. But large sums are wasted each year on projects which have never begun to return dividends in the form of increased commercial activity. Every marine man can read with instruction and profit the introductory article in this issue which by an original method checks up on federal appropriations for waterways and shows which investments have been wise and which have been otherwise.

These three proposals are certainly among the most important which can be made for aiding American shipping. Freedom from governmental interference and competition; wisdom in government legislation and care in necessary waterways appropriation, are three prime essentials which if wisely supplied would do much to make American shipping a real power. Decision to work for their accomplishment is a good New Year's resolution.

Late Flashes On Marine Disasters

Brief Summaries of Recent Maritime Casualties—
A Record of Collisions, Wrecks, Fires and Losses

NAME	DATE	NATURE	PLACE	DAMAGE RESULTING	NAME	DATE	NATURE	PLACE	DAMAGE RESULTING
Anna	Nov. 14	Fire	Norfolk	Slight	Lake Weir	Nov. 12	Heavy sea	Halifax	Lost chains
Aspen	Nov. 18	Aground	Columbia River	Not stated	Lincoln	Nov. 16	Collision	Captains Island	To bowspt.
Agiators	Nov. 24	Aground	Wood Island	Total loss	Linkmoor	Nov. 21	Disabled	Vayal	To rud. post
A. S. Upson	Nov. 18	Aground	St. Clair River	Floated	Liv	Nov. 22	Ashore	Landskrona	Floated
Aldebaran	Nov. 3	Collision	Antwerp	Undamaged	Lancing	Nov. 5	Aground	Soreham	Floated
A. Wicander	Nov. 3	Collision	Antwerp	Above-waterline	Lincoln	Nov. 30	Ashore	Governors Island	Floated
Apolo	Nov. 3	Collision	River Parana	Not stated	Lakeland	Dec. 4	Foundered	Lake Michigan	Not stated
Albert Hill	Nov. 25	Aground	Hous. Ship Chan.	Not stated	Macaria	Dec. 2	Ashore	Philippines	Floated
Arlington	Nov. 28	Disabled	Quarantine	To mach.	Marie J. Thompson	Dec. 2	Disabled	Nassau	Leaking
Asuncion de Larrinaga	Nov. 27	Collision	Charleston	Not stated	Mapledawn	Nov. 30	Ashore	Pigeon Island	Badly
Argun Maru	Nov. 10	Collision	River Scheldt	Slight	Marie Margarita	Nov. 6	Collision	Portsmouth	Sunk
Admiral Sebree	Nov. 13	Heavy sea	San Francisco	To prop.	Maasland	Nov. 10	Collision	Santos	Slight
Askild	Nov. 14	Disabled	Liverpool	To prop.	Mars	Nov. 10	Cyclone	Santiago	Total loss
Arcata	Nov. 29	Not stated	Puget Sound	Wrecked	Mossa	Nov. 10	Disabled	Gibraltar	Defect Mch.
Aube	Dec. 3	Stranded	Belle Isle	Not stated	Mexico	Nov. 13	Disabled	St. Thomas	To boilers
Belgenland	Nov. 20	Aground	River Scheldt	Slight	Missouri	Nov. 12	Hit sub. obj.	Chicago	To prop.
Betty	Nov. 21	Ashore	Bath	Slight	Max	Dec. 2	Gale	Spectacle Island	Wrecked
Birkenhead	Nov. 3	Aground	Philadelphia	Floated	Montevideo	Dec. 9	Coll., fog	Ambrose Lightship	To plates
Burpee L. Tucker	Nov. 4	Collision	Spencer Island	Not stated	Montoso	Dec. 9	Fire	San Juan	Not stated
Bennington	Nov. 28	Ashore	Point Aux Pins	Not stated	Malacca Maru	Dec. 9	Fire	Brooklyn	Slight
Cheyenne	Nov. 13	Ashore	Firth of Forth	Not stated	Missouri	Nov. 11	Hit obj.	Chicago	Lost wheel
Coahoma County	Nov. 13	Disabled	Falmouth	To mach.	Mandu	Nov. 13	Tch. ground	Victoria, Brazil	Leaking
Cyrus Field	Nov. 15	Disabled	Boston	Leaking	M. F. Elliott	Nov. 12	Collision	Hous. Ship Chan.	Not stated
Commercial Spirit	Nov. 18	Disabled	Philadelphia	To engine	Marboro	Nov. 15	Fire	New York	Not stated
Cape Ann	Nov. 17	Collision	Hous. Ship Chan.	To plates	M. J. Duffy	Nov. 19	Fire	New York	Slight
Comanche	Nov. 24	Ashore	Barrow in Furness	Floated	Marguerite M.	Nov. 24	Distress	Not stated	Not stated
Canadian Warrior	Nov. 19	Hit pier	Soo River	Slightly	Wemyss	Nov. 3	Collision	River Parana	Not stated
Cuyler Adams	Nov. 14	Ashore	Bar Point	Floated	Maule	Nov. 3	Aground	Chatnae Canal	Leaking
Crofter	Nov. 4	Aground	Gisselors	Floated	New Brunswick	Nov. 17	Fire	Bremen	To cargo
City of Rangoon	Nov. 6	Ashore	Balboa Straits	Leaking	Nomad	Nov. 16	Abandoned	Long Island Sd.	Sinking
Commercial	Nov. 25	Fire	Galveston	Not stated	Northumberland	Nov. 17	Ashore	Patuxent River	Not stated
Pathfinder	Nov. 28	Hit rocks	Seven Stones	Leaking	Newmona	Nov. 19	Collision	Port Richmond	To bow
Carlier	Nov. 28	Collision	River Scheldt	To bows	Niagara	Nov. 23	Ashore	Long Point	Floated
Canadian Pioneer	Nov. 13	Collision	Barry	Not stated	Nancy	Dec. 3	Disabled	Wilmington	Leaking
Capitaine Charles	Nov. 13	Stranded	Newcastle	To bottom	Nijkerk	Nov. 6	Collision	Gravesend	Not stated
Boivin	Nov. 14	Collision	Formby Lightship	Not known	Oregon	Nov. 3	Disabled	San Francisco	To st. pipe
Cheyenne	Nov. 13	Collision	Antwerp	Leaking	Or	Nov. 6	Aground, fog	Tees	Floated
Collin	Dec. 1	Disabled	St. John, N. B.	Lost prop.	Onaway II	Nov. 23	Ashore	Sullivan's Island	Floated
Carlier	Nov. 20	Disabled	Horta	Leaking	Parana	Nov. 13	Aground	Knappton (Oreg.)	Floated
Disco	Nov. 3	Disabled	Bremerhaven Rds.	Damaged	Pierre Michel	Sept. 20	Not stated	Hapthong	Sank
Daisy	Nov. 4	Collision	Shanghai	Not stated	Parks Foster	Nov. 23	Aground	Lime Kiln Cross.	Not stated
Director Kautz	Dec. 1	Collision	San Francisco	To deck	Paul Luckenbach	Nov. 3	Collision	Boston	Not stated
Diomed	Nov. 10	Heavy sea	Seven Foot Knoll	Floated	Prospero	Nov. 25	Ashore	Cape Bonavista	Floated
Dan F. Hanlon	Nov. 12	Aground	Red Hook	Floated	Peles	Nov. 13	Collision	Rotterdam	Not stated
Enrico Toti	Nov. 16	Ashore	Mississippi River	Slight	Prins Frederik Henrik	Nov. 14	Collision	Ymuiden	Slight
Edison	Nov. 14	Coll. fog	Tortugas	Floated	Pierre	Nov. 14	Capized	Royers Sluice	Not stated
Ellis	Nov. 20	Aground	Tremley Point	Destroyed	Pocahontas	Nov. 29	Aground	Southern Rocks	Floated
Elizabeth Freeman	Nov. 21	Explosion	Charleston	To boiler	Rotterdam	Nov. —	Aground; fog	Hook of Holland	Floated
Edgar Baxter	Nov. 23	Disabled	Ronne Harbour	Leaking	Reresby	Oct. 28	Disabled	Cardiff	Prop. lost
Edgehill	Nov. 6	Ashore	Tampico	Not stated	Rakuyo Maru	Nov. 18	Aground	Columbia River	Lost anchor
Elizabeth	Nov. 25	Ashore	New York	To steerer	Rakuyo Maru	Nov. 18	Collision	Portland	Slightly
Esperanza	Nov. 27	Heavy sea	Cape Haiti	To engine	Rebecca G. Whilldin	Nov. 18	Abandoned	Pollock Rip Slue	Towed
El Dia	Nov. 23	Disabled	Boston	Not stated	Romulus	Nov. 18	Drifting	Manzanillo	Broken
Flora	Nov. 3	Collision	Barbados	Not stated	Robert W. Pomeroy	Nov. 17	Heavy Sea	Lake Superior	prop. sft.
Frances Boutilier	Dec. 3	Foundered	Duluth	To plates	Renown	Nov. 3	Not known	Rotherhithe	Lost anchor
Freedom	Dec. 3	Collision	Chicago	To bows	S. L. Crosby	Nov. 13	Aground	Oyster Island	Floated
F. J. Luckenbach	Dec. 4	Collision	Hous. Ship Chan.	To plates	Surinam	Nov. 13	Disabled	Trinidad	To boiler tubes
F. W. Hart	Nov. 6	Hit pier	Fort de France	Leaking	Senator	Nov. 17	Collision	Hous. Ship Chan.	To plates
Francis L. Robbins	Nov. 12	Collision	Astoria	Not stated	Santa Cecelia	Nov. 16	Collision	Point Montara	Not stated
Giove	Nov. 14	Ashore	Halifax	To boiler	Sinasta	Nov. 19	Fire	New York	Slight
Gaviota	Nov. 17	Aground	Colchester	To bottom	Suscolanco	Nov. 18	Aground	Beacon	Not stated
Georgina Rolph	Nov. 18	Disabled	Padstow	Leaking	Saccarappa	Nov. 23	Disabled	St. Michaels	To boiler
Gunnar Heiberg	Nov. 14	Ashore	Havre	To plates	Strombus	Nov. 24	Ashore	Tampico	Leaking
G. H. Ingalls	Nov. 6	Disabled	Port Tampa	To steerer	Spen	Nov. 14	Collision	Ymuiden	Damaged
Gauntlet	Nov. 27	Hit quay	Peele Island	Floated	Superous	Nov. 14	Coll., bridge	Adelphi Steps	Sunk
Gand	Nov. 29	Disabled	Kim George's Dk.	To stem	Turret Crown	Nov. 10	Ashore	Midrum Bay Pt.	Not stated
Gov. John Lind	Nov. 14	Ashore	Redcar Jetty, Tees	Not stated	Texas	Nov. 17	Fire	Havre	Slight
Henry Steinbrenner	Nov. 3	Hit lock	Hous. Ship Chan.	Not stated	Totoku Maru	Nov. 18	Collision	Portland	Slight
Hobson's Bay	Nov. 6	Collision	San Pedro de	Leaking	Toledo	Nov. 19	Not stated	Lake Erie	Sank
Hayle	Nov. 25	Aground	Macoris	Badly	Terneskaer	Nov. 4	Ashore	Iceland	Total wreck
Harry G. Deering	Nov. 27	Disabled	Charleston	Badly	Tynan	Nov. 5	Aground	Shoreham	Floated
Hope Sherwood	Nov. 27	Collision	Liverpool	Badly	Trinidadian	Nov. 29	Aground	Beverly	To bottom
Hafersjord	Nov. 27	Collision	San Domingo	Undam.	Utacarbon	Nov. 13	Collision	San Pedro	Not stated
Hopper No. 12	Nov. 12	Disabled	Mobile	Mnmt' slt.	Umeali	Nov. 10	Collision	Hamburg	To bow
Iroquois	Nov. 13	Aground	Minas de Santa	Not stated	Victory	Nov. 19	Aground	Portland	Floated
Irene S. Wilkinson	Nov. 11	Aground	Lucia	Not stated	Vinemoor	Nov. 21	Disabled	San Pedro	To engine
Jubilee	Nov. 5	Ashore	Pointe Walde	Not stated	Veronica	Nov. 21	Disabled	Halifax	Not stated
Jacinto Suarez	Nov. 5	Ashore	Shoreham	Slight	W. F. White	Nov. 14	Aground	Port Huron	Floated
J. B. Paddon	Nov. 13	Collision	River Scheldt	Floated	West Hika	Nov. 15	Disabled	Charleston	To boiler
Jouffroy Abbans	Nov. 10	Aground	Racine	Floated	West Quechee	Nov. 18	Disabled	Kinsale	To prop.
John McCartney	Nov. 10	Disabled	Shanghai	Prop. lost	Washington	Nov. 16	Collision	Point Montara	To bow
Kennedy	Nov. 18	Disabled	Boothbay Harbor	To rudder	West Sequana	Nov. 11	Disabled	Manila	To engine
Jadden	Nov. 22	Fire	Galveston	To cargo	Wm. Boyce Thompson	Nov. 18	Fire	New York	Total loss
Kinefisher	Nov. 24	Disabled	Fenwick Island	To crankpin	West Eagle	Nov. 19	Collision	Port Richmond	Slight
Koraku Maru					West Inskip	Nov. 19	Disabled	Chatham	To engine
Kershaw					Zacapa	Nov. 11	Ashore	Great Inagua Isl.	Floated
					Zenon	Nov. 27	Fire	Galveston	To cargo

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Career of New President of Naval Architects

Admiral Taylor was born on March 4, 1864, in Louisa county, Virginia, the son of Henry Taylor and Mary Watson Taylor. He was educated at home and at Randolph-Macon college, Ashland, Va., until 1881, when he was appointed cadet engineer at the United States naval academy, passing second among 130 candidates. He graduated as a naval cadet in 1885 at the head of his class, receiving the highest percentage of marks of any graduate of the naval academy before or since. After a short cruise on the European station, he was sent to the Royal Naval college, Greenwich, England, as a special student for a course in naval architecture and marine engineering, graduating from that institution in 1888. His achievements there in competition with picked men from all parts of the world paralleled his record at the United States naval academy.

His work as a naval constructor since his appointment has been conspicuous. In 1894, he was ordered to the bureau of construction and repair as principal assistant to Chief Constructor Hichborn.

He had charge of the designs and building of the apparatus for the United States Model basin, whose construction was authorized in 1897. This was completed in 1899. From that time until December, 1914, his principal duty was in charge of the work of the model basin and his researches there have resulted in many improvements in the design of hulls of naval vessels. At home and abroad, he is recognized as the leading designer of the world for large, high-powered vessels.

Admiral Taylor is the author of two books, *Resistance of Ships and Screw Propulsion*, published in 1894, and *Speed and Power of Ships*, published in 1910, the latter particularly being regarded as the standard work on this subject. He has the honorary degree of doctor of engineering from Stevens' Institute, 1904; also doctor of science, George Washington university; doctor of laws, Randolph-Macon college, and doctor of laws, University of Glasgow, Scotland.

He designed the lines of practically all naval vessels from 1900 to 1922, and had a large part in the design of other features. The flush deck type of destroyer was one of his design. The centerline disposition of turrets was first proposed and advocated by him in 1895, but was not adopted until 10 years later in the SOUTH CAROLINA and MICHIGAN. It has since been adopted for the battle-ships of all nations.

Among the subjects investigated by Admiral Taylor at the United States Model basin was that of the suction or

hydraulic interaction between two vessels when one is passing the other. As a result of this investigation, when the Atlantic liner OLYMPIC and the English cruiser HAWKE had their collision off Cowes, England, in 1911, resulting in a lawsuit, Admiral Taylor was retained by the admiralty as an expert witness on the question of suction, the English government making the request upon the United States government. The idea of suction had never been accepted in an English court before, but as a result of his testimony, the judge accepted it in this case and decided in favor of the



ADMIRAL DAVID W. TAYLOR
International Authority on Ship Design and
Construction Who Has Been Elected President
of the Society of Naval Architects
and Marine Engineers

admiralty, a decision which has since been sustained in the English courts of last resort.

Admiral Taylor's official record is replete with commendatory expressions by his superiors. Secretary Daniels said of him: "An able officer whose service as head of the bureau of construction and repair has set the highest standard of efficiency. . . . No man in the navy did more ashore and afloat to secure naval efficiency." The French government decorated him with the order of commander of the Legion of Honor for "exceptional services in organizing the conduct of the war (naval construction)." Admiral Taylor's own government gave him the Distinguished Service medal "for exceptionally meritorious service in a duty of great responsibility as chief of the bureau of construction and repair."

Admiral Taylor was appointed chief constructor and chief of the bureau of construction and repair on Dec. 13, 1914, and continued in this position until transferred at his own request to the retired list of the navy in July, 1922.

Start Work On Great \$6,500,000 Liner

The contract for the big, fast 20,000-ton Matson passenger liner has apparently hurdled the last obstacle. On Dec. 16, the shipping board gave formal approval to the award of the contract to the William Cramp & Sons Ship & Engine Building Co., Philadelphia, at \$6,560,000.

This great liner will be run by the Matson Navigation Co. in its service from San Francisco to Honolulu. It is being built nominally to order of the American-Hawaiian Steamship Co., to take advantage of the provision in the merchant marine act of 1920 which allows excess and war profits taxes due under the revenue act of 1918 to be waived by the government provided the amount of the taxes, together with the addition of a sum twice as large as the taxes, be invested in building a new vessel in a private American yard, the ship to fly the American flag. The time limit under the act has expired, but with the Matson vessel under negotiation, the time was extended until details could be worked out. After completion, the American-Hawaiian will turn the vessel over to the Matson company.

Originally, the ship was bid on by the Cramp, Bethlehem and Newport News yards and the contract awarded to Cramp for about \$4,750,000. Later the navy department wanted changes made to adapt the ship for auxiliary service, and William Francis Gibbs, who handled the LEVIATHAN reconconditioning was selected to go over and modify the plans. The changes gave greater beam, increased passenger capacity and higher speed. The Cramp yard estimated the cost of the changes, and the shipowner decided to call for new bids. These were submitted Dec. 5 by a number of yards, the Cramp yard again receiving the award. Now with the shipping board's approval given, work can start.

The vessel will be the finest passenger ship ever built by an American yard and represents the largest merchant ship contract for a single vessel ever awarded an American yard. The liner will be of the twin screw type, with a speed of at least 22 knots, accommodations for about 680 first-class passengers, length of 582 feet, beam of 83 feet and displacement of about 20,000 tons. Electric driven geared turbines will propel the ship. A building period of 26 months is estimated, putting the ship in service early in 1927.

The liner will run to Honolulu from San Francisco in 4½ days, against a present 6-day schedule. The ship will have all the modern installations of the new transatlantic liners.